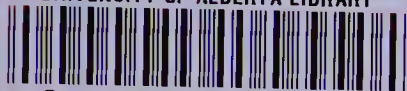


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TEACHER'S EDITION  
HOLT MATHEMATICS SYSTEM

# BOOK 5



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**Teacher's Edition**

**Holt**

**Mathematics**

**System**

**Book Five**

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# SCOPE AND SEQUENCE

The following chart gives an overview of mathematical content presented at this grade level, the grade level below, and the grade level above. It shows the extent to which each mathematical topic is presented from grade

to grade in the HOLT MATHEMATICS SYSTEM. It is hoped that this will help you to better prepare your lessons for a successful teaching experience.

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# TEACHER'S COMMENTARY

## THE HOLT MATHEMATICS SYSTEM

Two fundamental premises which underlie an effective learning system are:

1. Motivation is an important prerequisite to learning.
2. Each student may require a different motivational technique.

The HOLT MATHEMATICS SYSTEM (HMS) was developed to incorporate these premises. The various components of HMS provide a variety of motivational and instructional devices with which to reach students.

Teachers can present opportunities for learning through a medium best suited to the particular abilities and learning style of the individual student. The components of HMS are:

### Readiness

Student's Book  
Teacher's Edition

### Grade 1

Student's Book  
Teacher's Edition  
BFA Computational Skills Kit I

### Grade 2

Student's Book  
Teacher's Edition  
BFA Computational Skills Kit I  
BFA Math Problem Solving I

### Grade 3

Student's Book  
Teacher's Edition  
BFA Computational Skills Kit I  
BFA Math Problem Solving I  
Duplicating Masters

### Grade 4

Student's Book  
Teacher's Edition  
BFA Computational Skills Kit II  
BFA Math Problem Solving II  
Duplicating Masters  
Calculator Workbook

### Grade 5

Student's Book  
Teacher's Edition  
BFA Computational Skills Kit II  
BFA Math Problem Solving II  
Duplicating Masters  
Calculator Workbook

### Grade 6

Student's Book  
Teacher's Edition  
BFA Computational Skills Kit II  
BFA Math Problem Solving II  
Duplicating Masters  
Calculator Workbook

## TEACHING STRATEGIES

There is no one best way to teach mathematics to all students. Therefore, the HOLT MATHEMATICS SYSTEM is adaptable to many teaching styles.

Four different ways in which the program can be taught are:

- Teach the whole class together; have all students work on the same material at the same time, with the same written assignments.
- Teach the whole class together; have all students work on the same material at the same time, but differentiate the written assignments.
- Group the children and teach each group separately; each group may be doing different lessons on the same day.
- Use a continuous progress approach, letting each student progress at his or her own rate; every student could be working on a different lesson on any particular day. Suggestions in the *Teacher's Edition* provide assistance in differentiating the assignments.

## THE STUDENT'S BOOK

### Language

While it is important to teach students to become better readers, even within the framework of mathematics instruction, a deficiency in reading should not stand in the way of learning mathematics. The language used in the *Student's books* is uncomplicated and concepts are presented by means of illustrations or examples rather than by long verbal explanations.

Clear, concise titles, which appear at the top of every lesson, serve as a general description of content. A further note outlining the specific page object and subject matter is included at the bottom of every page.

### Content

The major primary grade concepts which appear throughout HMS are as follows:

Number and Numeration  
Operations and Properties  
Sentences  
Problem Solving and Application  
Geometry  
Measurement  
Graphs, Tables

Since students do not fully master any concept on the first encounter, this program of studies is presented in three stages:

- 1st — a thorough introduction
- 2nd — reinforcement and mastery
- 3rd — maintenance and extension.

Understanding is consistently reinforced as students bring their growing knowledge and maturity to bear upon more abstract concepts and more difficult skills.



## Developmental Aspects of Lessons

The HOLT MATHEMATICS SYSTEM is “developmental” in that each lesson is sequenced to proceed from an initial activity, through a learning stage, and finally to practice exercises. This lesson style (**display**, **development**, and **drill**) was adopted to give children an understanding of the concepts in the lessons through active participation in the development of the concepts or skills, followed by practice in the use of these concepts.

Each lesson follows a definite pattern: (1) **display** — an *initial activity* where hands-on materials such as blocks are used to teach the concept; the initial activity appears in the side column of the *Teacher's Edition* for every lesson. (2) **development** — a *learning stage* which uses pictures and other visual hints to develop the concept; the learning stage is the first part of the Exercises where the child is guided, through the use of coloured numerals or other hints, to the pattern of response. To provide immediate reinforcement, the answer to some of the developmental items, indicated by circles, are placed in the back of the *Student's book*. (3) **drill** — *exercises* which drill the concept or skill presented in the display; the exercises are the items which the children do individually to demonstrate understanding.

## Basic Skills

HMS embodies the philosophy that it is important for the student to develop a concept or skill meaningfully. However, a meaningful development needs to be followed by practice. To become a proficient user of mathematics one has to practise the skills that have been acquired. Accordingly, ample practice is provided to diagnose areas of difficulty and to maintain skills.

Throughout the program, a large number of computational exercises are presented with over 4000 in each book, Grades 2 to 6. Additional exercises may be found in the other HMS components.

Exercises which extend the developmental items presented in the lesson are starred. Additional challenges are provided by the **Braintickers** which appear throughout the book.

HMS repeatedly asks students to discover patterns. These experiences are intended to help build a sense of relationship between numbers and to develop self-reliance when a problem is tackled. Discovering patterns is an enjoyable activity since it is usually accompanied by a sense of anticipation.

## Diagnosing

Diagnostic materials appear throughout HMS in a variety of formats. The **Basic Skills Check Ups**, which are part of HMS from Readiness to Grade 6, provide experience in the type of format that is often used on standardized tests.

**Cumulative Reviews** in Grades 3 to 6 enable the teacher to pinpoint areas of the child's achievement or deficiency prior to studying other concepts in the text. Based on the results, one can determine what combination of learning experiences will best help each child.

All **Check Ups** and **Cumulative Reviews** are keyed in the *Teacher's Edition* to the pages on which the skills were presented.

The **Chapter Test** at the end of each chapter can also be used diagnostically. Each exercise in the test is referenced in the *Teacher's Edition* to a specific objective and page number. This provision enables the teacher to review specific concepts and skills needing improvement.

A **Cumulative Test Item Bank**, located at the front of each *Teacher's Edition* (Grades 1 to 6), covers a representative sampling of the entire year's objectives. There are two matching items per objective in the Grades 3 to 6 tests, thereby offering the opportunity for repeat testing. The **Cumulative Test** for Grades 1 and 2 is presented in a multiple-choice type format.

## Maintaining Skills

Keeping acquired skills sharp is important to HMS. Maintenance pages therefore appear regularly throughout the pupil books. **Keeping Fit** (Grades 1 and 2) and **Tune Up** (Grades 3 to 6) are mixed frequently with stimulating **Practice** pages to help reinforce specific facts and concepts.

At the end of each book are collected additional **Extra Practice** exercises, keyed to the appropriate pages in the *Student's book*.

Additional and supplementary practice material in the form of duplicating masters, computational and problem solving skills kits, and a calculator workbook are also available and are keyed to the program.

## Testing

A complete testing program for monitoring students' progress is provided within HMS. **Chapter Tests** (called “Think” in Grades 1 and 2) at the end of each chapter are designed to help evaluate the extent of mastery of the essential chapter content. In the *Teacher's Edition*, test items are referenced to pupil page numbers and specific objectives which are listed for each chapter. An invaluable measuring device, the **Chapter Tests** allow teachers to diagnose the particular strengths and weaknesses of each student.

Additional test materials and supplementary tests are available in the form of *duplicating masters* (Grades 3 to 6).

## Measurement

The measurement section in HMS is completely SI metric. The strand features a “hands-on” approach to measurement augmented by written exercises which further broaden and reinforce the concepts.

Often a page of nonstandard, informal units of measure will help introduce the activities and exercises developing the established measurement system.

## Problem Solving

Solving problems is one of the major strands in HMS. We start problem solving early and use it as a tool for reinforcing basic facts.

The development of problem-solving skills is very gradual. It is based essentially on (1) interpreting action pictures, (2) joining and separating sets of objects, and (3) solving word problems without pictures. Word problems are first presented in the form of mini-problems which contain a picture dictionary to help children read the printed words. Mini-problems contain only those words which are necessary for an understanding of the problems.

From these careful beginnings, problem solving in HMS is expanded to include:

- reading word problems
- choosing a number sentence to fit a word problem
- writing number sentences
- estimating the answer
- recognizing extraneous and insufficient information
- reading information from tables or graphs
- choosing the correct operation
- solving word problems related to careers
- multiple-step problems
- drawing pictures to help solve problems
- establishing and using a problem-solving technique

to mention a few.

The challenge of providing children with an opportunity to grow systematically in the ability to solve problems is met by incorporating word problems into many of the lessons throughout the program.

In addition to this rich and systematic program of developing problem-solving skills, HMS includes a lesson on problem solving related to a selected career in each chapter. This career strand is of considerable importance to this program and is therefore discussed in detail.

## Career Strand

Making children aware of existing careers makes mathematics learning relevant, realistic, and motivational.

Specifically, the purpose of the HMS career strand is twofold:

- To stimulate career awareness in children by presenting them with problems which deal with situations related to various careers, and
- To provide teachers with the essential information about various careers.

Appropriate learning experiences or activities are provided in the *Teacher's Edition* for lessons dealing with careers. These lessons are adapted to the developmental level of the child.

The careers are chosen to focus on certain specific objectives:

- To help the child develop an awareness of physical skills
- To develop an awareness of self and others
- To help students develop self-reliance
- To develop an awareness of a multitude of careers
- To develop social awareness

Each chapter highlights one or more specific careers and provides the opportunity to discuss others.

## Activity Pages

Interspersed throughout the texts are **activity** pages. **Activity** pages provide motivation and active participation on the part of the child. Concepts are developed or practised through the use of activities.

## Chapter Themes

In an effort to motivate children and to interrelate mathematics to other subject areas, some chapters in these books are oriented toward certain themes. For example, the theme of a chapter may pertain exclusively to transportation, fairy tales, the sea, the farm, the community, the circus, foreign lands, and others. The illustrations in these chapters emphasize the theme of the chapter. These themes are identified in the **Chapter Overviews**.

## THE TEACHER'S EDITION

The *Teacher's Edition* is the key to using HMS. All references to components of this program, as they apply to each lesson, are provided literally at one's fingertips. With this type of manual, the teacher can easily direct children to other practice materials, guide them to activities, and provide them with projects that will extend their mathematical horizons.

The layout for each individual lesson contains a reduced version of the pupil page with answers superimposed. Surrounding this are the related lesson commentaries closely positioned to allow quick and easy access.

## Front of Teacher's Edition

A **Scope and Sequence** chart displays three years of topics and the extent to which they are presented in HMS. Using the chart, it is easy to tell, at a glance, where any particular lesson falls in the flow and scheme of the whole Mathematics System.



An **Activity Reservoir** section, consisting of mathematical games and activities, provides a framework for enjoyable practice work throughout the year. These games and activities are keyed into individual lessons, but each may be adapted and used at the discretion of the teacher.

A **Problem of the Week** section consists of challenging mathematical puzzles and problems. These are for additional motivation. They can be offered to children via the bulletin board or a special problem box.

A **Cumulative Test Item Bank** is supplied for the evaluation of the children's achievement with respect to part or all of the entire year's work. Pupil edition page references which are located along the margins of this section, allow the teacher to select items which test the appropriate desired objective. This format also allows the teacher to test on a regular basis or periodically spot check, as the particular situation may require.

## Chapter Overview

**Chapter Overviews** are appropriately interleaved before each chapter. Each overview consists of the following parts:

An **Introduction** explains what content is to be studied in the chapter.

**Objectives** for the chapter are stated in behavioural terms.

**Background** provides a meaningful setting for the mathematical concepts and skills taught in the chapter.

**Materials** lists the materials that are suggested for use in teaching the lessons.

**Career Awareness** describes the career to be studied in that chapter and provides background information for discussion. When necessary a caption is given for the photograph illustrating the career (Grades 1 and 2).

## Lesson Commentaries

Daily lesson commentaries generally provide varied approaches to teaching the lessons. Each lesson commentary, in the side columns of the *Teacher's Edition*, contains the following categories:

**Objectives** for each lesson are stated in behavioural terms. These objectives state very specifically what a child ought to be able to do at the end of the lesson.

**Pacing** suggestions are provided for some lessons to indicate how assignments may be differentiated.

Level A: a minimum course

Level B: an average course

Level C: an extended course

**Vocabulary** lists new words and terms introduced in the lesson.

**Materials** lists teaching aids helpful for teaching the lesson.

**Related Aids** keys the appropriate supplementary components of the program to the particular lesson.

**Background** provides a meaningful setting for mathematical concepts on which the lesson is based.

**Suggestions** usually provide readiness-type learning experiences which encourage children's involvement. This section contains the **Initial Activity** comments that may be completed before using the pupil page.

**Using the Book** provides specific teaching instructions for the lesson.

**Activities** provide varied learning experiences such as mathematical games, research projects, experiments, and so on that represent additional practice, enrichment, or extension. The activities are usually listed in order of difficulty.

**Extra Practice** supplies additional exercises which are appropriate to the content of the particular page. The assignment of these **Extra Practice** exercises, whether they be used orally as review preceding the next page, placed on cards or chalkboards as remedial exercises or perhaps for fast finishers, is of course left up to the discretion of the teacher.

## SUPPLEMENTARY MATERIALS

*Duplicating Masters* provide extra practice for selected lessons, graph paper, dot paper, cutouts for activities, nets for geometry and additional chapter tests.

*BFA Computational Skills Kits I* (Grades 1 to 3) and *II* (Grades 4 to 6) provide a diagnostic/prescriptive program for both instruction and practice. Simple placement tests help identify each child's level.

*BFA Math Problem Solving I* and *II* offer instruction and practice in solving math story problems. The kits are organized into five sections: Addition/Subtraction; Multiplication/Division; Application; Review; Enrichment.

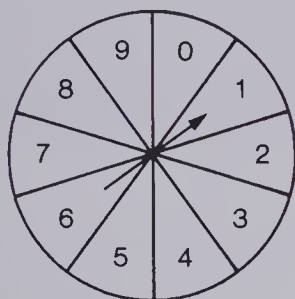
*Calculator Workbook* provides an opportunity to use the calculator to explore topics formerly thought to be too difficult and tedious. The exercises are related directly to the concepts developed in the *HMS Student's book*. Emphasis is on generalizing concepts, using larger numbers, and extension of concepts.

# ACTIVITY RESERVOIR

## THE P.V. GAME

**Use:** To practise place-value skills involving comparison of numbers

**Materials:** Construct a spinner using the digits 0 to 9. (Blank dice or number cards can also be used.)



**Players:** Any number (or two teams)

**The Game:** On a piece of paper, each player draws three blanks. \_\_\_\_\_. A designated player (or caller) twirls the spinner and calls out the indicated digit. The players may place this digit in any one of their three blank spaces. The caller repeats this procedure two more times. Each player uses the digits to build a “personal number”. The player with the greatest number is the winner. (Or, the team to which the winner of the round belongs scores one point. The first team to score five points is the overall winner.)

Students will soon develop strategies for placing the digits in the most potentially favourable positions.

**Variations:** 1. Use 4 or 5 blanks to extend the game to thousands and ten thousands.  
2. Play the same game for LEAST NUMBER.  
3. Practise comparing decimal numbers by using 4 to 6 blanks arranged for 2 decimal places.

\_\_\_\_\_ • \_\_\_\_\_  
4. Practise adding, subtracting, and comparing the answers by having the players draw sets of blanks for addition and subtraction.

+ \_\_\_\_\_ - \_\_\_\_\_

The numbers obtained by spinning are placed in the blanks. The player with the greatest sum (or difference) wins.

## QUAD-ROW

**Use:** To practise addition facts, column addition, computation

**Materials:** 15 counters in each of 4 colours, 5 dice with the numerals 1 to 6, game board (20 cm × 20 cm) as shown

**Players:** From two to four

**The Game:** Players may roll from one to five dice. As each player takes a turn, the sum of the numbers rolled indicates the square that may be covered on the board by that player.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
1	8	9	16	17	24	25	2	3	10
2	7	10	15	18	23	26	1	4	9
3	6	11	14	19	22	27	30	5	8
4	5	12	13	20	21	28	29	6	7
30	29	28	27	26	25	24	23	22	21
11	12	13	14	15	16	17	18	19	20
10	9	8	7	6	5	4	3	2	1

If a player rolls a total that has already been covered everywhere on the board, that player may roll one additional die and add this to his or her total. This number may then be covered if it is available. The first player to cover four in a row, i.e., “Quad-Row”, horizontally, vertically, or diagonally wins the game.

When all of a player’s counters have been placed, that player may move a counter to a new location on each subsequent turn. This continues until the game has been won.

**Variations:** 1. Use “Quad-Row” to practise multiplication. Prepare a game board as shown and use 3 dice.

1	2	3	4	5	6	8	9
10	12	15	16	18	20	24	25
27	30	32	36	40	45	48	50
54	60	64	72	75	80	90	96
100	108	120	125	144	150	180	216

Each player, in turn, throws 3 dice and finds the product of the numerals represented on the faces that are “up”. After finding the product, the player covers the square containing the product with a coloured counter. (The diagram above illustrates the possible products. The order that these products are arranged on the board is not important). If a product is already covered, the player throwing this product must miss a turn.



2. Use “Quad-Row” to practise division. Use a game board (20 cm × 20 cm) as shown and 1 die.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

A player may place a counter on a square that contains a number which is divisible by the number rolled. (If a player rolls a 5, cover *one* of 5, 10, 15, ..., 100.)

## BINGO

**Use:** To practise basic facts, arithmetic operations, mental computations, naming geometric figures and shapes

**Materials:** Blank game sheets, counters, paper and pencils for computation. If necessary, problem cards (optional).

**Players:** Any number

		FREE BEE!		

**The Game:** Distribute the blank game sheets. Have the players randomly select and write in numerals and/or words from a predetermined, displayed set of answers (e.g., numerals from 0-35; fractions from  $\frac{1}{2}$ ,  $\frac{2}{2}$ ,  $\frac{1}{3}$ ,  $\frac{2}{3}$ , ... to  $\frac{7}{7}$  inclusive; decimals from 0.0, 0.1, 0.2, ... to 2.9 inclusive; even dollar amounts from \$10 to \$40; names of plane and 3D shapes; etc.) Circulate to be sure that (a) all squares on the game sheet are used, (b) no number, word, shape, etc. has been repeated.

Call out or display a problem (e.g.,  $4 \times 8$ ;  $\frac{4}{6} - \frac{3}{6}$ ;  $\$2.25 + \$3.75$ , etc.) and have the players cover that number if it appears *anywhere* on their sheet. (Using “under the B”, “under the G”, as in regular Bingo, makes for too drawn out a game.)

There are various ways of declaring a winner:

(a) five markers in a row vertically, horizontally, or diagonally

(b) four corners covered

(c) the whole sheet covered.

Emphasize that the first person to cover the required squares and raise their hand is the winner. Variations (a) and (b) are quickly completed. You may wish to put the called-out problems on cards and reward the winners by having them designated as the “caller” for the next round.








## DOMINOES

**Use:** To practise basic facts and recognition, renaming, and matching skills

**Materials:** At least 20 dominoes made from light card-board

**Players:** Two or more

**The Game:** Prepare a set of domino cards with appropriate notation. The ends of each card must match the end of some other card in the deck. To begin, each player is given 4 dominoes. The remaining cards are left face down on a desk between the players. One of these “middle cards” is turned face up and serves as the starting point. The players take turns matching a domino in hand with one that has been played. If a play cannot be made, the player must draw another domino from the middle set. The object of the game is to be the first to play all dominoes held in hand. Sample cards are as shown.

	$\frac{1}{2}$		$\frac{1}{4}$		$\frac{2}{5}$		$\frac{3}{10}$
		triangle		square	circle	0	cube
$\frac{1}{10}$	0.3	$\frac{3}{10}$	$\frac{7}{10}$	0.7	0.4	$\frac{2}{5}$	0.1

**Variation:** Deal all dominoes equally among the players. Each player displays their own run-on domino sentence. The winner is the player who used the most dominoes in his or her display.

75%	$\frac{36}{100}$	36%	0.44	$\frac{44}{100}$	28%	0.28	0.15
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CONCENTRATION

**Use:** To practise basic facts and recognition, renaming, and matching skills

**Materials:** Index cards

**Players:** From two to four

**The Game:** Prepare 10 to 15 pairs (20 to 30 cards in all) of appropriate facts cards. Shuffle the cards and place them face down on a desk in a regular array. To begin, the first player turns over a card and names the figure (or word) which appears. The same player then turns over and names a second card. If the two cards match, that player scores one point, removes these cards from the array, and takes another turn. If they do not match, both cards are turned face down and the next player proceeds. Students must “concentrate” to recognize and remember the various card locations. The player with the most points after all cards have been paired is the winner. Some sample card pairs are shown.

$3 \times 6.0$

$9.0 + 9.0$

$\frac{3}{100}$

0.03

$3 \times 100$

300

10 cm

1 dm

$100 \div 10$

$100 \times 0.1$

$\frac{3}{4}$

$\frac{9}{12}$

**Variation:** For an added challenge, include a third card in each set to play “Triple Concentration”. Triple sets are easy to make for (a) equivalent fractions (fractions and decimals) (b) fraction grids (c) measurement unit relationships (i.e., 2 m, 200 cm, 2000 mm) (d) number expressions (i.e., 15,  $5 \times 3$ ,  $10 + 5$ ) (e) characteristics of shapes (i.e., no flat faces, sphere, no corners).

BATTER UP

**Use:** To practise operation skills, solving problems, and equivalence

**Materials:** Playing board, spinner (popsicle stick or large paper clip), question cards (at least 50), markers (8 of each of 2 colours)


**Players:** Two or more

**The Game:** The question cards should reflect the skills or concept to be developed and/or reviewed. Supply a separate answer sheet to keep score and resolve any disagreements. Baseball style scoring applies. Some sample cards are shown.

$$\begin{array}{r} 300 \\ \times 6 \\ \hline \end{array}$$


1 km = ■ m

Type of angle?

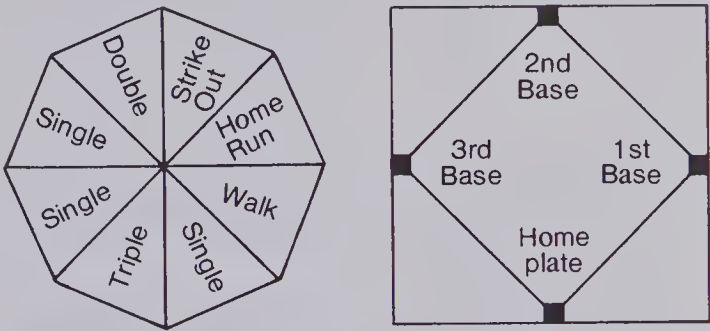


Perimeter?

3 m



Players form two teams, and flip a coin to determine which team plays first. Team members take turns drawing a problem card and solving it. If the problem is solved correctly, the spinner is twirled and the player advances a marker accordingly (and, if necessary, markers already in play). An incorrectly answered problem is considered to be a strike out. After 3 strike outs, the other team is “at bat”. The game lasts a pre-determined number of innings.

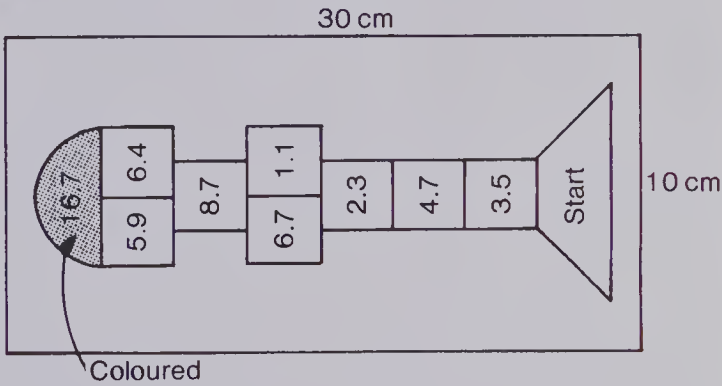


HOPSCOTCH

**Use:** To practise operation skills

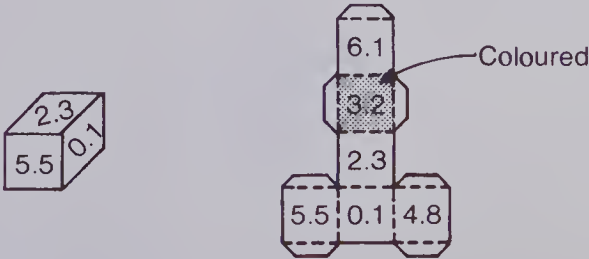
**Materials:** Game board and die

**Players:** Two to four



**The Game:** Each player takes a turn rolling the die. Players must add the number on the die to the next number on the hopscotch board. When a player comes to a double, he or she must add all three numbers. In this case:

$2.3 + 6.7 + 1.1$



If a player makes an error in addition, that player must go back to the start. Rolling a 3.2 (the coloured face) entitles that player to a bonus roll. The first player to reach the coloured semicircle in the game board wins.

**Variations:** Use different sets of numbers on the cube and on the game board to practise different skills. For example, for short division with remainders, use 64, 32, 35, 24, 76, 44, 48, 81, and 54 on the game board and 3, 5, 7, 6, 8, and 9 on the die.



## FRACTION CARDS

**Use:** To practise equivalence and comparison of fractions

**Materials:** 2 sets of playing cards. Set A should show:

0, 1,  $\frac{0}{2}$ ,  $\frac{1}{2}$ ,  $\frac{2}{2}$ ,  $\frac{0}{4}$ ,  $\frac{1}{4}$ ,  $\frac{2}{4}$ ,  $\frac{3}{4}$ ,  $\frac{4}{4}$ ,  $\frac{0}{8}$ ,  $\frac{1}{8}$ , ...,  $\frac{8}{8}$ ,  $\frac{0}{16}$ ,  $\frac{1}{16}$ , ...,  $\frac{16}{16}$ .

Set B (a different colour) should show: 0, 1,  $\frac{0}{3}$ ,  $\frac{1}{3}$ ,  $\frac{2}{3}$ ,

$\frac{3}{3}$ ,  $\frac{0}{6}$ ,  $\frac{1}{6}$ , ...,  $\frac{6}{6}$ ,  $\frac{0}{9}$ ,  $\frac{1}{9}$ , ...,  $\frac{9}{9}$ ,  $\frac{0}{12}$ ,  $\frac{1}{12}$ , ...,  $\frac{12}{12}$ .

**Players:** Two or more

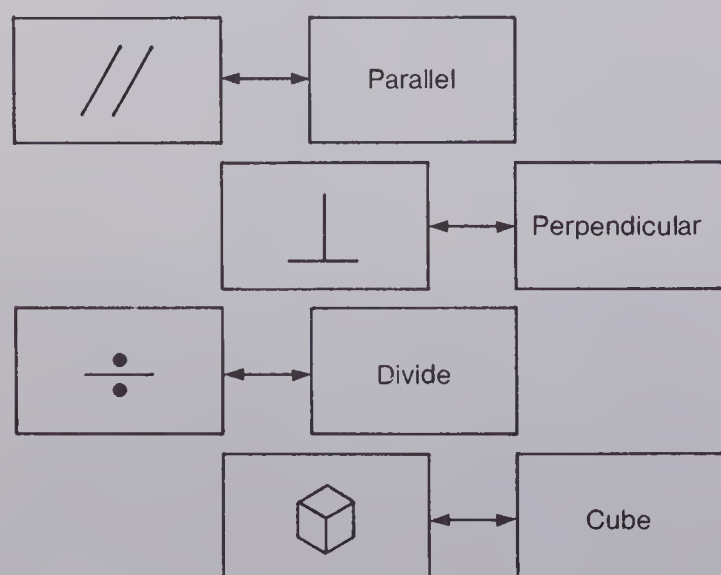
**The Games:** Card decks as described can be used to play many ordering and matching games, three of which are as follows.

**Fraction Fishing** Cards are shuffled and scattered face down on a desk. Players simultaneously draw a card from the collection. The player with the greatest fraction wins that set. If the cards are equal, the first player to say "equal" wins that set. The player with the most sets when the card collection is depleted is the overall winner.

**Think Quick** Shuffle and scatter the cards as for "Fraction Fishing". Provide a series of instruction cards such as: "Choose any 6 cards. Put them in order, smallest to largest"; "Choose 2 cards. Write any fraction that would come between"; "Choose any card. Write an equivalent fraction for it"; "Choose any card. Add  $\frac{1}{2}$  to the fraction shown. Write the sum"; "Choose any card. Subtract it from 1. Write the difference"; etc. Players read and race to complete the instructions. The first one to correctly complete the task wins the round. First player to win 5 times is the overall winner.

**Fraction Snap** Shuffle the cards and divide the deck between two players. The players simultaneously flip a card face up on the table. The first player to identify equivalence, when it occurs, wins all cards that have been played. The player with the most cards after a predetermined amount of time is the overall winner.

**Variation:** The cards described above can be used as the basis for an "equivalence deck" with which to play "Snatch and Match". Select a number of equivalent fraction cards and augment the deck to yield about 50 pairs with cards such as these.



Deal all cards to players (about 6 to 12). Each player begins by matching and discarding any matching cards they hold. The dealer then "snatches" 1 card (unseen) from the player to the immediate left and "matches" it to a card in hand, if possible. This "Snatch and Match" process continues around the circle of players, till someone matches the last card in hand. That player is the winner.

## OMEGA-Y

**Use:** To practise basic facts, mental calculations, functions

**Materials:** Chalkboard or overhead projector, (a drawing or model of Omega-Y — a robot — is optional)

**Players:** Any number

**The Game:** The leader starts by saying to the players, "Give Omega-Y a number." Any number is acceptable, but it is suggested the numbers be from 0 to 10. If a student says "3", the leader writes on the chalkboard or overhead projector: "3 → 15" and says, "Omega-Y gives you 15."

The leader repeats this demonstration several times (e.g., "6 → 30", "7 → 35") and asks, "Can you guess what Omega-Y does with your number?"

When it is obvious a number of students know the rule, the leader may vary the directions by saying, "Omega-Y gives 7. Using the rule, what number will you give back?" [35] The first person identifying a correct response becomes the new leader.

The game can be simplified (by supplying rule cards for each leader) or made as difficult as necessary to provide a suitable challenge (by having each leader fabricate a new rule).

## TREASURE HUNT

**Use:** To find uses of mathematics, practise measurement skills, and review concepts

**Materials:** Index cards with appropriate lists

**Players:** Two or more teams

**The Game:** Make up separate lists of 5 things that are to be found by each team. Suggested lists are:

1. five things the linear measure of which are to be calculated.
2. five linear measures for which students are to find items.
3. modify each of the above to involve mass, capacity, area, volume, time, and temperature.
4. types of graphs students can find in newspapers, magazines, etc.
5. geometric shapes or examples of geometric relationships that students can identify in the immediate environment.
6. math applications for which students can find real examples: e.g., percent, fractions, money, time, millions, place value, etc.

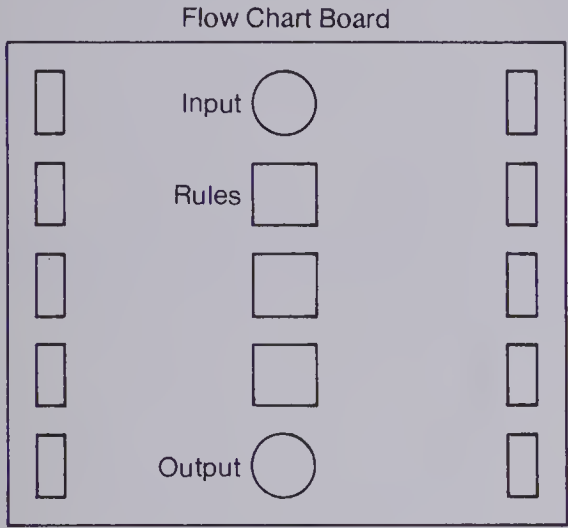
The lists should be different so that the game can be played repeatedly by simply exchanging lists. The first team to correctly complete its list wins.

INPUT-OUTPUT

**Use:** To practise mental computation

**Materials:** Tagboard flow chart, number strips appropriate for different skills, blank strips for “output”

**Players:** Two or more



Sample Input Strip

0.5	3.0	4.5	10	0.3	15
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Sample Rule Strips

$\times 10$	$\times 100$	$\times 0.1$	$\times 0.2$	$\times 1000$	
$+ 4$	$- 3$	$+ 1.5$	$- 4.5$	$- 10$	$+ 10$
$+ 0.5$	$\div 10$	$\div 100$	$\div 1$	$\div 2$	

**The Game:** Student A adjusts the strips so that an “input” and one or more “rules” are present in the flow chart. Student B is to calculate the “output”. Student A checks B’s answer. (The use of a calculator to check will add zest to the game.) The two players then reverse roles. There is one point for each correct “output”. The player with the most points after 10 turns each is the winner.

**Variations:** 1. Strips can be designed

- (a) to check equivalence of decimals, fractions, and percents. The output is YES or NO.
- (b) for which common factors (or multiples) can be calculated.
- (c) which show fractions. The rule strip could read: “Write the common denominator.”, “Write the least common denominator.”, “Reduce the fraction.” etc.

2. Instead of scoring each correct output, time each response and keep a record of response times. The player with the lowest time total after 5 turns is the overall winner.

NUMBER SENTENCE

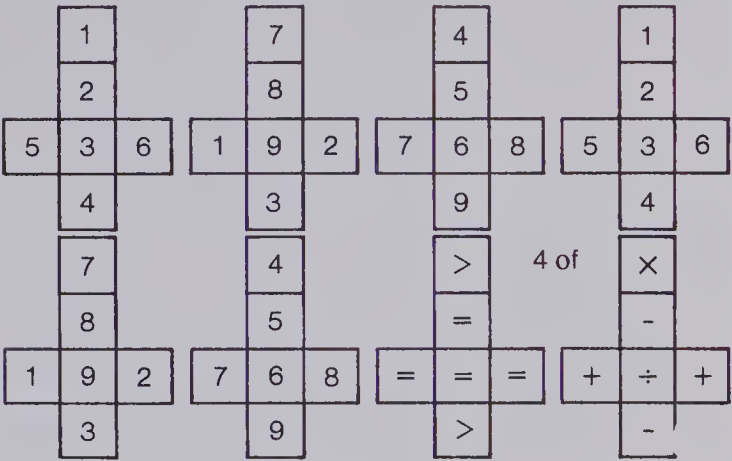
**Use:** To practise making equations, and to identify equations and inequations

**Materials:** 11 dice (nets for which are shown)

**Players:** Two to four

**The Game:** Players take turns rolling all 11 dice. Each player tries to make an equation using as many dice as

possible. Each die used scores one point. The player with the highest total after 7 turns is the winner. (A player who is forced to make an inequation scores an automatic 2 points.) The numbers and symbols on the dice are as shown.



**Variations:** The game can be further complicated by:

- (a) having each player achieve a score equal to the value expressed by the equations (e.g.,  $55 \div 5 = 11 \times 1$  scores 11, not 9) thereby presenting the need to choose between possible equations.
- (b) allowing anyone who identifies an error to correct it and score instead.
- (c) allowing the use of parentheses to increase a potential equation value.

SPIDER AND THE FLY

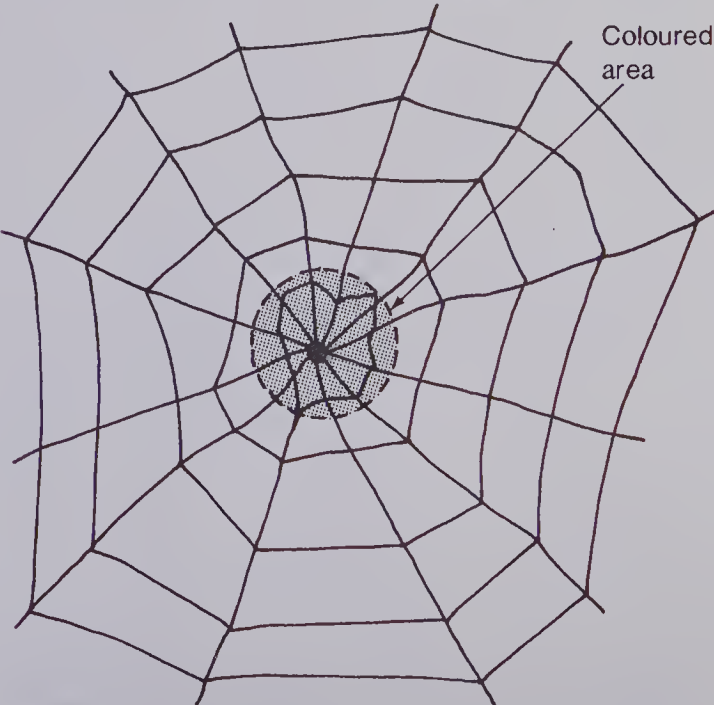
**Use:** To practise mental computation

**Materials:** Game board, deck of skill cards, small counters or bingo chips

**Players:** Three to five

Sample cards

$\frac{2}{3}$ of 15 = ?	$3 \times 0.6$	1 cm = ■ mm	$9 \overline{)56}$
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**The Game:** Assign one person to be “the spider” and place one counter for that person to use at the centre of the web. All other players are “flies”. Place “fly



counters” (all the same colour) at each intersection point on the outer circle of the web. The spider gives a skill card to the first fly. If that card is correctly answered, the fly may move *any* fly counter to any adjacent intersection point (forward, backward, sideways) on the web. The spider then moves one space, in any direction in pursuit of flies, and deals a skill card to the next fly. Each fly player endeavours to: (a) answer skill cards, and (b) move counters into the shaded area in the centre of the web. A fly player scores 1 point each time he or she advances a fly counter to the coloured section before being caught.

If the spider lands upon an occupied intersection, that fly is considered caught and is removed from the web.

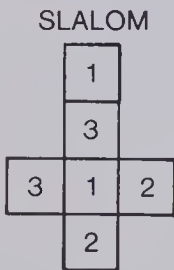
Stress to all that fly players do not *own* counters on the web. Each fly player may move any fly counter regardless of who was previously using it, after correctly answering a skill card. When each person has had a chance to be the spider, the player with the highest point total wins.

### SLALOM

**Use:** To practise basic facts; identifying transformations and shapes; calculating perimeter, area, and volume; rounding

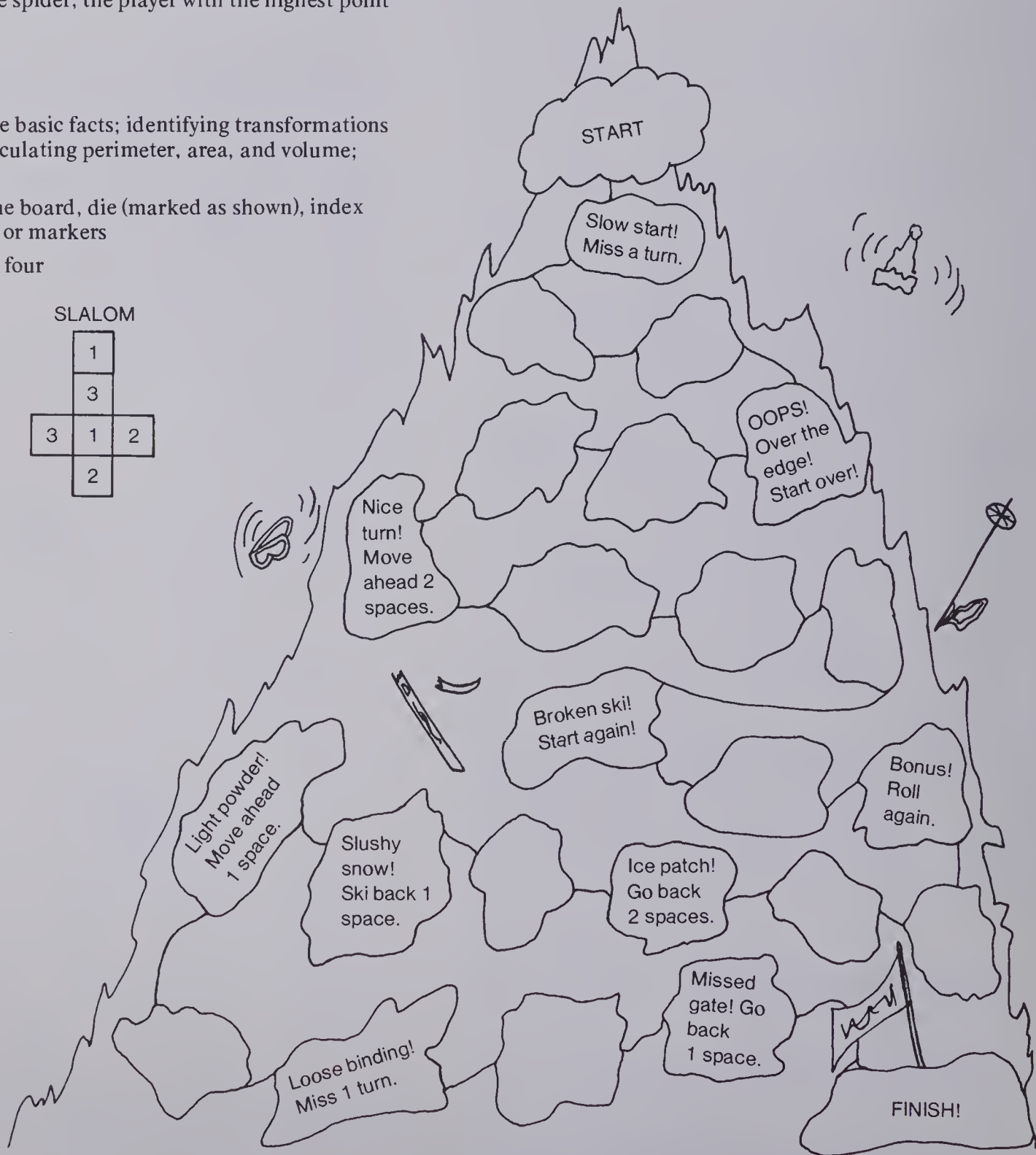
**Materials:** Game board, die (marked as shown), index cards, counters or markers

**Players:** Two to four



**The Game:** Prepare a set of skills cards (about 50) labelled according to the topics being tested (e.g., illustrations of slides, flips, turns; plane and 3D shapes; marked rectangular prisms labelled “Volume?”; marked plane shapes labelled “Perimeter?”; rounding cards labelled “16.261 → ? (nearest tenth)”; missing number cards such as “ $9 \times \blacksquare = 54$ ”, “ $200 - \blacksquare = 50$ ”, “ $\frac{1}{8} + \blacksquare = \frac{6}{8}$ ”; etc. To begin, the first player chooses a skill card. If the card is correctly completed, that player may roll the die, advance his or her counter the number of spaces indicated, and follow, if necessary, any instructions on the spot upon which he or she lands. The winner is the first player to “ski the course”.

**Variation:** Use the foregoing rules and materials with this twist: if an incorrect response is given, that player rolls the die anyway and moves *back* the number of spaces indicated.



# PROBLEMS OF THE WEEK

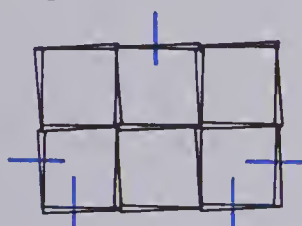
1. In a field are some geese and some horses. There are 16 heads and 40 legs. How many geese and how many horses are in the field? **12 geese and 4 horses**

2. Morris has 4 times as many dimes as Hank. Morris has \$1.50 more than Hank. How many dimes does each have? **20 and 5**

3. A frog is at the bottom of a well. Each day he jumps up 3 m and each night he slides back down 2 m. He gets out of the well on the 6th day. How deep is the well? **8 m.**  
**At the beginning of the 6th day he is at the 5 m mark.**

4. Father has \$80 in paper money in his pocket. He has the same number of \$1, \$2, and \$5 bills. How many bills of each kind does he have? **10**

5. Place 17 toothpicks as shown to form 6 small squares.



(a) Remove 5 to leave 3 squares each the same size as the original small squares.

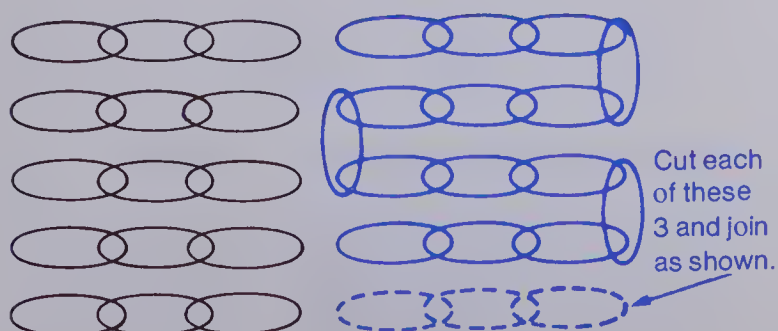
**Remove those marked with colour.**

(b) Make up more problems like (a) for your classmates.

6. Write any 3 digits and repeat them to form a 6-digit number, e.g., 235 235. Divide this number by 7, divide this quotient by 11, and finally divide this quotient by 13. What do you notice about the final quotient? Repeat with other sets of 3 digits. Is the result always the same? **Result is always the 3 digits you started with. Reason:  $7 \times 11 \times 13 = 1001$  and  $1001 \times ABC = ABC\ ABC$ .**

7. A man who had a fox, a duck, and a bag of corn had to cross a river in a boat. The boat was only large enough to hold the man and one of his possessions. If he left the duck and corn together, the duck would eat the corn. If he left the duck and fox together, the fox would eat the duck. How did he get all his possessions across the river safely? **Take the duck across. Then take the fox across and the duck back. Then take the corn across and finally the duck.**

8. How can these 5 chains be joined to form one chain by cutting less than 4 links?



9. We can use two to four 4's and any of the operation signs  $+$ ,  $-$ ,  $\times$ ,  $\div$  to make different values.

Examples:  $\frac{4}{4} = 1$ ,  $\frac{4+4}{4} = 2$ ,  $4 \times 4 + \frac{4}{4} = 17$

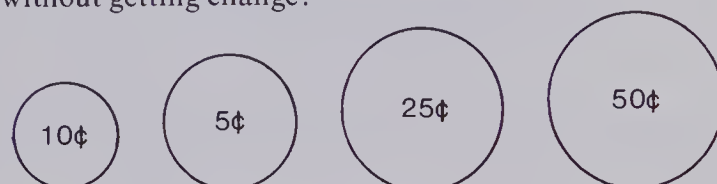
How many of the numbers between 1 and 50 can you make this way? Repeat for 3's and 5's.

10. Draw any quadrilateral. Find the midpoint of each side by bisecting each. Join the four midpoints in order. What is the name of the new shape you get?

**Parallelogram**

Repeat for other quadrilaterals. Is the new shape always the same type? **Yes, always a parallelogram.**

11. I have these coins. What amounts can I spend without getting change?



Solution: 1 coin 5¢, 10¢, 25¢, 50¢

2 coins 15¢, 30¢, 35¢, 55¢, 60¢, 75¢

3 coins 40¢, 65¢, 80¢, 85¢

4 coins 90¢

12. If December 25 falls on a Monday, on which day does it fall one year later? **It falls on a Tuesday, but if the year following is a Leap Year, it falls on a Wednesday.**

13. A printer got these letters and numbers mixed. Find the digits (0, 1, 2, ..., 9) that should replace the letters.

(a) $\begin{array}{r} 43\ t\ 8 \\ -m72\ n \\ \hline n\ 52 \end{array}$	(b) $\begin{array}{r} s279 \\ +91t7 \\ \hline z2y6x \end{array}$	(c) $\begin{array}{r} pq6b \\ +39d4 \\ \hline 8342 \end{array}$	(d) $\begin{array}{r} 7gt9 \\ -k36v \\ \hline 5484 \end{array}$
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$m = 3$

$t = 7$

$n = 6$

$s = 3$

$x = 6$

$t = 8$

$y = 4$

$z = 1$

$b = 8$

$d = 7$

$q = 3$

$p = 4$

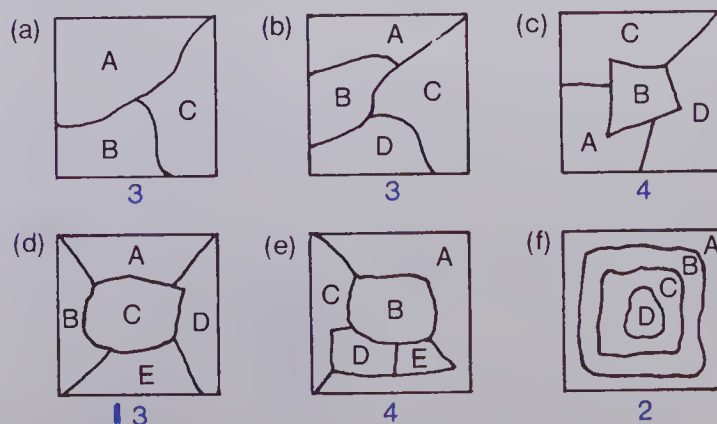
$v = 5$

$t = 4$

$g = 8$

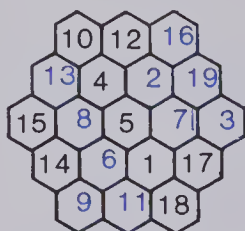
$k = 2$

14. Each of the patterns represents part of a map. The countries are identified by letters. Copy each map. Then colour each map so that no two countries with the same boundary have the same colour. What is the *fewest* number of colours necessary for each map?





15. Copy and complete the magic hexagon. Each row or column = 38.



16. A snail starts at the vertex of a cube and crawls along the edges. He crawls along as many edges as he can without coming to a vertex the second time. What is the maximum number of edges he can crawl along? **7**

17. Every even number greater than 2 can be written as the sum of two primes.

$$4 = 2 + 2 \quad 6 = 3 + 3 \quad 8 = 5 + 3$$

Write the next 11 even numbers as the sum of two primes.

$$5 + 5, 7 + 5, 7 + 7, 13 + 3, 13 + 5, 17 + 3, 17 + 5, 17 + 7, 23 + 3, 23 + 5, 23 + 7$$

18. What are the next 4 numbers in each pattern?

- (a) 1, 1, 2, 3, 5, 8, 13, 21, ...  
**34, 55, 89, 144. Add the 2 preceding numbers.**
- (b) 1, 2, 3, 6, 12, 24, ...  
**48, 96, 192, 384. Add all the previous numbers.**
- (c) 1, 4, 9, 16, ...  
**25, 36, 49, 64. Each consecutive number multiplied by itself.**
- (d) 0.125, 0.25, 0.375, 0.5, ...  
**0.625, 0.75, 0.875, 1.0. Add 0.125 to the previous number.**

19. Place 3 coins with two heads and one tail up.



Turn two coins over in each move. In three moves finish with 3 tails up.

**Solution:**

H	H	T
T	H	H
H	T	H
T	T	T

20. Shown are six views of the same block.

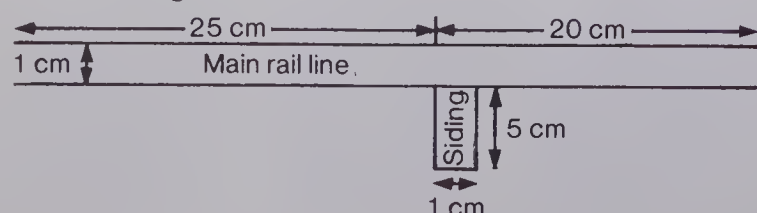


Which design is opposite each of the following?



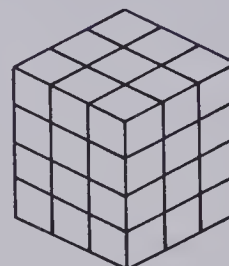
(It may help to make a cube!) **Answers are in colour.**

21. A fast moving express train catches up to a slow freight train. Both trains are moving in the same direction. Finally, they come to a section of track that has a small siding.



Use centimetre cubes to make both trains and place them on the track. The express train should have 12 blue cars and 1 black engine; the freight train should have 9 yellow cars and 1 red engine. What is the quickest way for the express train to pass the freight train? **Solution:** Freight train passes siding, backs 5 cars on to the siding, leaves them there and goes on down the track. Express train moves past siding, backs in, picks up the 5 cars from the freight train, moves ahead, backs down the track and leaves the 5 cars there. Freight train backs onto siding. Express train continues on its way. Freight train moves back onto the track and recouples.

22. These questions refer to the figure shown.



- (a) How many different cubes can you see in the view shown? **24**
- (b) How many separate cubes are needed to build this one big shape? **36**
- (c) If 6 outside faces of this shape are painted red, how many cubes
- have only 1 face painted? **10**
  - have exactly 2 faces painted? **16**
  - have exactly 3 faces painted? **8**
  - have exactly 4 faces painted? **0**
  - have no faces painted? **2**

23. Stella cut some pictures out of a magazine for a math project. She cut out pages 31, 32, 56, 57, 58, and 103. How many sheets of paper did she cut from the magazine? **4**

24. The sum of two numbers is 20. Their product is 96. What are the two numbers? **8 and 12**

25. The sum of ten numbers is 110. If 2 is added to each number, what is their sum? **130**

26. Jeff's father paid Jeff 1¢ the first time he mowed the lawn, 2¢ the second time, 4¢ the third time, 8¢ the fourth time, and so on, doubling the amount each time. Jeff mowed the lawn 15 times in the summer. How much did Jeff earn? **\$327.67**

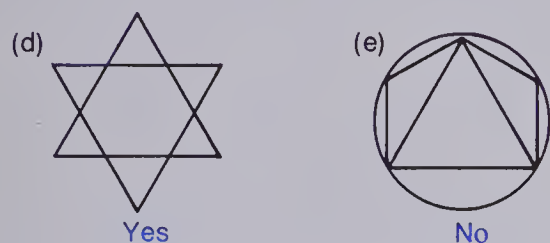
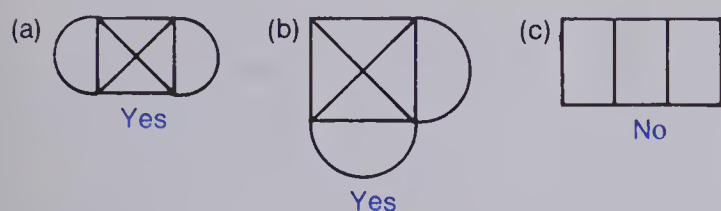
27. Find these products by multiplying.

$$\begin{array}{r} 11 \\ \times 11 \\ \hline 121 \end{array} \quad \begin{array}{r} 111 \\ \times 111 \\ \hline 12321 \end{array} \quad \begin{array}{r} 1111 \\ \times 1111 \\ \hline 1234321 \end{array}$$

Can you find these products without multiplying?

$$\begin{array}{r} 11111 \\ \times 11111 \\ \hline 123454321 \end{array} \quad \begin{array}{r} 111111 \\ \times 111111 \\ \hline 12345654321 \end{array} \quad \begin{array}{r} 1111111 \\ \times 1111111 \\ \hline 1234567654321 \end{array}$$

28. Which of these designs can you draw or trace without retracing a line or lifting the pencil from the paper?



29. There are 11 different ways to add 8 odd numbers to get a total of 20. Changing the order does not count, but you can repeat a number. One solution is:

$$7 + 7 + 1 + 1 + 1 + 1 + 1 + 1 = 20$$

How many other ways can you find?

Solutions:

3	3	3	3	3	3	1	1
5	3	3	3	3	1	1	1
5	5	3	3	1	1	1	1
5	5	5	1	1	1	1	1
7	3	3	3	1	1	1	1
7	5	3	1	1	1	1	1
7	7	1	1	1	1	1	1
9	3	3	1	1	1	1	1
9	5	1	1	1	1	1	1
11	3	1	1	1	1	1	1
13	1	1	1	1	1	1	1

30. Fractions with a numerator of 1 are called unit fractions, e.g.,  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ , etc.

Find two unit fractions whose sum is each of these.

(a)  $\frac{5}{6}$       (b)  $\frac{7}{12}$       (c)  $\frac{9}{20}$       (d)  $\frac{10}{24}$

$$\frac{1}{2} + \frac{1}{3}, \quad \frac{1}{3} + \frac{1}{4}, \quad \frac{1}{4} + \frac{1}{5}, \quad \frac{1}{4} + \frac{1}{6}$$

31. Find two consecutive numbers whose squares differ by 11. 5 and 6

32. Express 26 as the sum of two prime numbers.

$$13 + 13, 23 + 3, \text{ or } 19 + 7$$

33. Express 17 as the sum of three prime numbers.

$$13 + 3 + 1, 7 + 5 + 5, 11 + 3 + 3, \text{ etc.}$$

34. Cubes!

$$2 \times 2 \times 2 = 8 \quad 8 \text{ is a cube.}$$

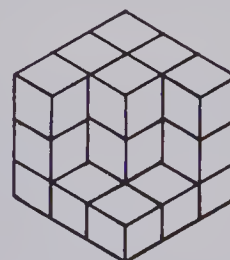
$$3 \times 3 \times 3 = 27 \quad 27 \text{ is a cube.}$$

Which *cube* is a palindrome? (A palindrome reads the same forwards as backwards. 353, 818, and 292 are palindromes.)  $7^3 = 343$

35. Use a  $10 \times 10$  grid. Plot these points. Connect the dots.

(1,9), (5,9), (5,10), (6,10), (6,9), (10,9), (10,8), (7,7), (6,3), (7,3), (6,2), (5,2), (4,3), (5,3), (4,7), (1,8), (1,9).

36. These questions refer to the figure shown.



(a) How many separate cubes are needed to build this shape? 21

(b) How many different cubes can you see in the view shown? 14

(c) If *all* outside faces are painted, how many cubes

(i) have only 1 face painted? 3

(ii) have exactly 2 faces painted? 6

(iii) have exactly 3 faces painted? 9

(iv) have exactly 4 faces painted? 3

(v) have exactly 5 faces painted? 0

(vi) have no faces painted? 0

(d) How many cubes can you not see in the view shown? 7





# CUMULATIVE TEST ITEM BANK

These items test a number of the major objectives in this book. In using these test items, select from the set up to the page on which your class is working at present. Set A and Set B are matched items to provide opportunity for a pre and post testing or for repeat testing of the objectives. The pages can be easily removed and duplicated if you wish to distribute the test. Be certain that all of the children are familiar with the accepted answer format, whether it involves writing answers directly on a duplicated sheet, or on a separate sheet or workbook page. Demonstrate the sample items on the chalkboard and be sure there are no questions before beginning the test.

## Sample Items

Write each as a decimal. (a) zero decimal six (b) $\frac{4}{10}$	$\begin{array}{r} 2.4 \\ +6.5 \\ \hline \end{array}$
--	--

## Answers to Test

1. Add 19, 31, 42, 55    2. Subtract 8, 14, 29, 32    3. 377
4. 395 ha    5. 10 042    6. 42 367    7. 683    8. 933    9. (a) 0.3  
(b) 0.7 (c) 0.27    10. (a) 0.2 (b) 0.2 (c) 0.43    11. (a) 7.0  
(b) 5.3 (c) 1.7 (d) 1.1    12. (a) 5.5 (b) 17.7 (c) 5.4 (d) 4.4
13. (a) \$40.54 (b) 70.02 (c) \$400.25 (d) 390.06
14. (a) \$20.01 (b) 59.89 (c) \$36.77 (d) 378.92    15. 12.6 cm
16. 1.67 m    17. (a) 3050 (b) 6406 (c) 2800.25 (d) 4253.28
18. (a) 9200 (b) 7030 (c) 1204.65 (d) 8310.03    19. (a)  
4351.60 (b) 3721.75    20. (a) 6013.06 (b) 3113.43    21. (a) <  
(b) <    22. (a) < (b) <    23. \$23.06    24. no    25. 200 000  
+ 30 000 + 7000 + 0 + 40 + 1    26. 300 000 + 0 + 7000  
+ 900 + 50 + 6    27. (a) 628 010 (b) 489 920    28. (a)  
430 000 (b) 299 094    29. 4 hundred thousands;  
2 thousands; 5 thousandths    30. 5 ten thousands; 2 tens;  
6 hundredths    31. (a) 4500 (b) 5000 (c) 4531    32. (a)  
5400 (b) 5000 (c) 5365    33. (a) 4300 (b) 400    34. (a) 7400  
(b) 1200    35. 1566    36. 999    37. (a) CCXXXIV  
(b) MCMLXXXIII    38. (a) DLXII (b) MMCCCXLVII
39. (a) 5 (b) 9 (c) 6    40. (a) 6 (b) 12 (c) 8    43. 1770 kg
44. 94    45.  $\angle MOP, \angle POM$     46.  $\angle PAT, \angle TAP$
47. (b)    48. (a)    49. 12 cm    50. 9 cm    51. 
52.     53. (a) and (b)    54. (a) and (c)    55. (a) — (iii),  
(b) — (ii), (c) — (i)    56. (a) — (iii), (b) — (i), (c) — (ii)
57. 70°    58. 110°    59. (a) and (c)    60. (a) and (c)
61.  $A \rightarrow R, M \rightarrow T, N \rightarrow Y$     62.  $I \rightarrow O, T \rightarrow T, S \rightarrow P$
63.  $ED \rightarrow XB, ET \rightarrow XO, DT \rightarrow BO$     64.  $AB \rightarrow UE,$   
 $AC \rightarrow UD, CB \rightarrow DE$     67. (b)    73. \$3.00    74. \$2.90
75. 0.2 m    76. 1.2 km    77. \$90    78. \$80    79. 21 000
80. 26 000    81. 276 000    82. 1400    83. (a) 3624 (b) 2067
84. (a) 5913 (b) 9001    85. (a)  $(4 \times 1000) + (3 \times 100) +$   
 $(7 \times 10) + (5 \times 1)$  (b)  $(2 \times 1000) + 0 + 0 + (3 \times 1)$
86. (a)  $(5 \times 1000) + (6 \times 100) + (7 \times 10) + (9 \times 1)$   
(b)  $(8 \times 1000) + (8 \times 100) + 0 + (6 \times 1)$     87. (a) 448  
(b) 783    88. (a) 406 (b) 408    89. (a) 3066 (b) 4812
90. (a) 4608 (b) 6381    91. 592 228    92. 252 115    93. (a)  
45 000 (b) 42 000    94. (a) 24 000 (b) 90 000    95. (a) 1.6  
(b) 52.2    96. (a) 25.2 (b) 28.0    97. (a) 241.8 (b) 143.5
98. (a) 334.8 (b) 632.8    99. (a) \$291.60 (b) \$4498.65
100. (a) \$132.36 (b) \$3333.30    101. \$107.25    102. \$762.75
103. (a) 16.712 (b) 42.048    104. (a) 77.427 (b) 63.826
105. 18.084 cm    106. 18.432 cm    107. 420 000
108. 40 000    109. (a) 3132 (b) 1872    110. (a) 1482  
(b) 3248    111. (a) 10 258 (b) 9436    112. (a) 14 382  
(b) 24 054    113. (a) 26 796 (b) 5 993 072    114. (a) 228 844  
(b) 1 682 178    115. 285 390 kg    116. 208.75 t    117. 32.8
118. 68.6    119. (a) 1622.4 (b) 3674.0    120. (a) 1857.0  
(b) 6038.4    121. (a) 2.457 (b) 2.9416    122. (a) 3.3858  
(b) 4.543    123. 3.677 96    124. 39.872    125. 7    126. 9
127. 8    128. 8    129. (a) 14 (b) 25    130. (a) 13 (b) 22
131. (a) 56 (b) 223    132. (a) 89 (b) 324    133. 80.96
134. 100    135. (a) 61.4 (b) 61.4    136. (a) 4.9 (b) 4.9
137. (a) 600 (b) 1.5    138. (a) 7.65 (b) 560    139. (a) 2.3  
(b) 150    140. (a) 330 (b) 4.5    141. (a) 36 (b) 4.5 (c) 270  
(d) 0.375    142. (a) 51 (b) 47 (c) 6.67 (d) 850    143. (a) 8.9  
(b) 900    144. (a) 6.3 (b) 12 000    145. (a) 7.036 m  
(b) 703.6 cm    146. (a) 8.402 m (b) 84.02 dm    147. 16.5 m
148. 21.9 km    149. 4 km    150. 6 km    151. 12    152. 4 L
153. (a) 1250 (b) 0.375    154. (a) 4.25 (b) 52 000
155. (a) 0.6 (b) 7600    156. (a) 8 (b) 4300    157. various
158. various    159. (a) 2000 (b) 3.75    160. (a) 5000  
(b) 5.28    161. (b)    162. (a)    163. 15.8°C    164. 13.8°C
165. (a) 180 (b) 144    166. (a) 42 (b) 5.5    167. 16 425 min
168. 930 min    169. 04:00    170. 21:30    171. 98 L
172. 6    173. Accept reasonable estimates.    174. 6 cm
175. 7    176. 8    177. 4    178. 4    179. 7    180. 8
181. 54    182. 32    183. 24    184. 23    185. (a) 24 (b) 123
186. (a) 54 (b) 231    187. 405    188. 802    189. 206
190. 105    191. 23    192. 55    193. (a) 54 R3 (b) 24 R6
194. (a) 27 R6 (b) 19 R40    195. (a) 46 R3 (b) 26 R12
196. (a) 34 R6 (b) 54 R22    197. 132 kg    198. 300°C
199. 10 square units    200. 6 square units    201. 45 square  
units    202. 70 square units    203. 24 cm<sup>2</sup>    204. 50 cm<sup>2</sup>
205. 13    206. 10    207. 16    208. 12    209. 24 cm<sup>2</sup>
210. 48 cm<sup>2</sup>    211. (a) 4 (b) 6    212. (a) 4 (b) 7    213. F
214. F    215. (0, 1, 2)    216. (0, 1, 2)    217. (a) (0, 1, 2)  
(b) (0, 1, 2, 3, 4, 5)    218. (a) (0, 1, 2, 3, 4) (b) (0, 1, 2, 3)
219.  $33 - 7 = 26$     220.  $8 \times 4 = 32$     221. 1 356 000 000 km
222. 5 987 000 000 km    229. 11.1, 15.1, 20.6    230. 10.5,  
21, 42    231. 8, 11, 20, 35    232. 4, 9, 19, 44    233. 800,  
1600, 2400, 3200, 4000    234. 110, 220, 330, 440, 550
235. (a) | (b) —    236. (a) vertical line (b) horizontal line  
(c) neither (d) horizontal line (e) vertical line    237. A(4,1),  
B(2,4)    238. P(3,2) Q(4,3)    239. D, M, K, E    240. W, V,  
R, P    241. 345    242. 492    243. 100    244. 140    245. 0
246. 0    247. 0    248. 0    249. no answer    250. no answer
251. 192    252. 657    253. 36 mm    254. 4.8 cm    255. (a)  
(iii) and (iv) (b) (iii) and (iv) (c) (ii)    256. (a) (i) and (iii)  
(b) (ii) (c) (iii) and (iv)    257. 36    258. 27    261. (a) P  
(b) C (c) C (d) P    262. (a) P (b) C (c) P (d) C    263. 1, 2,  
3, 6    264. 1, 2    265. 4    266. 9    269. 15, 30, 45
270. 20, 40, 60    271. 20    272. 40    273.  $10 \times 10$
274. 1000 or  $10 \times 10 \times 10$     275. 10<sup>3</sup>    276. 10<sup>5</sup>    277. \$2.76
278. \$2.32    279. 5    280. 7    281. 12    282. 15    283. 10



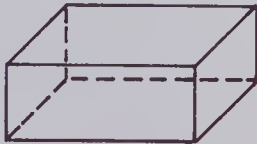
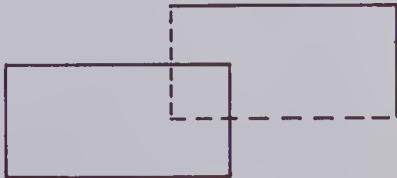
# Answers to Test

*continued*

284. 20    285. (a)  $>$  (b)  $<$     286. (a)  $>$  (b)  $<$     287. (a)  $\frac{4}{8}$  or  $\frac{1}{2}$  (b)  $\frac{4}{10}$  or  $\frac{2}{5}$     288. (a)  $\frac{6}{10}$  or  $\frac{3}{5}$  (b)  $\frac{4}{6}$  or  $\frac{2}{3}$   
 289. (a)  $\frac{10}{8}$  or  $1\frac{1}{4}$  (b)  $\frac{12}{10}$  or  $1\frac{1}{5}$     290.  $\frac{6}{5}$  or  $1\frac{1}{5}$  (b)  $\frac{11}{9}$  or  $1\frac{2}{9}$     291. (a) 0.7 (b) 0.715    292. (a) 0.3 (b) 0.61  
 293. (a)  $\frac{4}{10}$  (b)  $\frac{278}{1000}$     294. (a)  $\frac{9}{10}$  (b)  $\frac{156}{1000}$     295. (b) and (d)  
 296. (c) and (d)    297. 21    298. 24    299.  $\frac{3}{4}$     300.  $\frac{2}{3}$     301. (a)  $=$  (b)  $\neq$     302. (a)  $=$  (b)  $\neq$     303. (a)  $N = 12$  (b)  $M = 18$   
 304. (a)  $N = 28$  (b) 35    305.  $3\frac{3}{6}$  or  $3\frac{1}{2}$     306.  $3\frac{1}{8}$   
 307. 12    308. 15    309.  $\frac{13}{18}$     310.  $\frac{17}{20}$     311.  $\frac{22}{48}$  or  $\frac{11}{24}$   
 312.  $\frac{17}{30}$     313. 20    314. 12    315.  $4\frac{11}{15}$     316.  $6\frac{1}{12}$   
 317.  $2\frac{3}{8}$     318.  $5\frac{7}{20}$     319.  $\frac{7}{9}$     320.  $\frac{6}{10}$     321. (a) 0.6 (b) 0.65    322. 0.625 (b) 0.28    323. (a) 70% (b) 44%  
 324. 28% (b) 15%    325. 32%    326. 24%    327. (a) 0.3 (b) 0.55    328. (a) 0.2 (b) 0.75    329. \$20    330. \$18  
 331. 28%    332. 40%    333. 24    334. 28    335. 1392.79  
 336. 710.44    337. 518 402    338. 500 607    339. (a) 22 940 (b) 73.5    340. (a) 20 976 (b) 403.2    341. (a) 23 R 3 (b) 247 R 10    342. (a) 20 R 3 (b) 304 R 21    343. 60 t, 56 t  
 344. \$32 000, \$30 595.10    345. 2800    346. 1400  
 347. 3000, 3072    348. 1000, 1152    349. (a) 45 (b) 203  
 350. (a) 57 (b) 413    351. (a) 3.3 (b) 46.3    352. (a) 4.9 (b) 32.6    353. (a) 3.25 (b) 1.46    354. (a) 3.31 (b) 4.14  
 355.  $(6 + 8) \div 2$     356.  $(36 \div 6) - 4 = 2$     357. 11    358. 67  
 359. 0    360. 12    361. 54    362. 62    363. 10%    364. 34%  
 369. 2    370. 3    373. (c)    374. (b)    375. (c), turn  
 376. (d), slide    381.  $A \rightarrow R, P \rightarrow O, T \rightarrow D$     382.  $D \rightarrow R, F \rightarrow A, P \rightarrow Q, G \rightarrow M$     385. yes    386. no

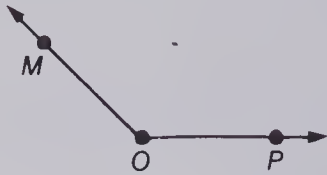
Page	A	B																												
	<p>1. What is the rule? Complete the table.</p> <table><tr><th colspan="2">Rule: ?</th></tr><tr><th>Enter</th><th>Display</th></tr><tr><td>2</td><td>21</td></tr><tr><td>6</td><td>25</td></tr><tr><td>12</td><td>■</td></tr><tr><td>23</td><td>■</td></tr><tr><td>36</td><td>■</td></tr></table>	Rule: ?		Enter	Display	2	21	6	25	12	■	23	■	36	■	<p>2. What is the rule? Complete the table.</p> <table><tr><th colspan="2">Rule: ?</th></tr><tr><th>Enter</th><th>Display</th></tr><tr><td>14</td><td>6</td></tr><tr><td>16</td><td>8</td></tr><tr><td>22</td><td>■</td></tr><tr><td>37</td><td>■</td></tr><tr><td>40</td><td>■</td></tr></table>	Rule: ?		Enter	Display	14	6	16	8	22	■	37	■	40	■
Rule: ?																														
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16	8																													
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37	■																													
40	■																													
	<p>3. A saleswoman sold 596 kitchen sinks in 2 months. In the first month, 219 were sold. How many did she sell in the second month?</p>	<p>4. A farmer has 2310 ha (hectares) in wheat and barley. He has 1915 ha in wheat. How many hectares of barley does he have?</p>																												
	<p>5. Calculate.</p> $\begin{array}{r} 6031 \\ 2548 \\ +1463 \\ \hline \end{array}$	<p>6. Calculate.</p> $\begin{array}{r} 26\ 341 \\ 1\ 421 \\ 3\ 602 \\ +11\ 003 \\ \hline \end{array}$																												
	<p>7. A gardener put 286 apple trees in one row and 397 in another row. How many apple trees are in the 2 rows?</p>	<p>8. A stamp collector has 347 stamps in one book and 586 in a second book. How many stamps does the collector have in the two books?</p>																												
10	<p>9. Write each as a decimal. (a) zero decimal 3 (b) <math>\frac{7}{10}</math> (c) <math>\frac{27}{100}</math></p>	<p>10. Write each as a decimal. (a) zero decimal 2 (b) <math>\frac{2}{10}</math> (c) <math>\frac{43}{100}</math></p>																												
20	<p>11. (a) <math display="block">\begin{array}{r} 4.3 \\ +2.7 \\ \hline \end{array}</math> (b) <math display="block">\begin{array}{r} 3.7 \\ +1.6 \\ \hline \end{array}</math></p> <p>(c) <math display="block">\begin{array}{r} 3.4 \\ -1.7 \\ \hline \end{array}</math> (d) <math display="block">\begin{array}{r} 4.0 \\ -2.9 \\ \hline \end{array}</math></p>	<p>12. (a) <math display="block">\begin{array}{r} 2.5 \\ +3.0 \\ \hline \end{array}</math> (b) <math display="block">\begin{array}{r} 8.0 \\ +9.7 \\ \hline \end{array}</math></p> <p>(c) <math display="block">\begin{array}{r} 8.6 \\ -3.2 \\ \hline \end{array}</math> (d) <math display="block">\begin{array}{r} 9.0 \\ -4.6 \\ \hline \end{array}</math></p>																												
	<p>13. (a) <math display="block">\begin{array}{r} \\$39.45 \\ + 1.09 \\ \hline \end{array}</math> (b) <math display="block">\begin{array}{r} 57.03 \\ +12.99 \\ \hline \end{array}</math></p> <p>(c) <math display="block">\begin{array}{r} \\$250.36 \\ + 149.89 \\ \hline \end{array}</math> (d) <math display="block">\begin{array}{r} 260.08 \\ +129.98 \\ \hline \end{array}</math></p>	<p>14. (a) <math display="block">\begin{array}{r} \\$28.70 \\ - 8.69 \\ \hline \end{array}</math> (b) <math display="block">\begin{array}{r} 68.08 \\ - 8.19 \\ \hline \end{array}</math></p> <p>(c) <math display="block">\begin{array}{r} \\$60.00 \\ - 23.23 \\ \hline \end{array}</math> (d) <math display="block">\begin{array}{r} 526.00 \\ -147.08 \\ \hline \end{array}</math></p>																												
	<p>15. Place the decimal in order to make the statement reasonable. Karen's handspan is 126 cm.</p>	<p>16. Place the decimal in order to make the statement reasonable. Melvin is 167 m tall.</p>																												
	<p>17. Write each numeral. (a) 3 thousands, 0 hundreds, 5 tens, 0 ones (b) <math>6000 + 400 + 0 + 6</math> (c) 2 thousands, 8 hundreds, 0 tens, 0 ones, 2 tenths, 5 hundredths (d) <math>4000 + 200 + 50 + 3 + 0.2 + 0.08</math></p>	<p>18. Write each numeral. (a) 9 thousands, 2 hundreds, 0 tens, 0 ones (b) <math>7000 + 0 + 30 + 0</math> (c) 1 thousand, 2 hundreds, 0 tens, 4 ones, 6 tenths, 5 hundredths (d) <math>8000 + 300 + 10 + 0 + 0.0 + 0.03</math></p>																												
	<p>19. (a) <math display="block">\begin{array}{r} 2341.39 \\ +2010.21 \\ \hline \end{array}</math> (b) <math display="block">\begin{array}{r} 6003.04 \\ -2281.29 \\ \hline \end{array}</math></p>	<p>20. (a) <math display="block">\begin{array}{r} 4003.07 \\ +2009.99 \\ \hline \end{array}</math> (b) <math display="block">\begin{array}{r} 5002.31 \\ -1888.88 \\ \hline \end{array}</math></p>																												



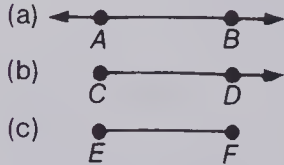
Page	A	B
	<p>21. Complete using <math>&gt;</math>, <math>=</math>, or <math>&lt;</math>.            (a) <math>468 \bullet 488</math>            (b) <math>6117.62 \bullet 6118.41</math></p> <p>23. Mark earned \$23.57 and \$16.12 in two days of work. He spent \$19.63. How much did he have left?</p> <p>25. Write in expanded form.            237 041</p>	<p>22. Complete using <math>&gt;</math>, <math>=</math>, or <math>&lt;</math>.            (a) <math>724 \bullet 729</math>            (b) <math>8680.06 \bullet 8680.18</math></p> <p>24. The lengths of two cars are 3.4 m and 4.2 m. Will the two fit in a garage that is 7.3 m long?</p> <p>26. Write in expanded form.            307 956</p>
35	<p>27. (a) <math>\begin{array}{r} 417\,321 \\ +210\,689 \\ \hline \end{array}</math> (b) <math>\begin{array}{r} 620\,014 \\ -130\,094 \\ \hline \end{array}</math></p> <p>29. Give the meaning of each underlined digit. 5 <u>4</u>32 141.0<u>3</u><u>5</u></p> <p>31. Round 4531.34:            (a) to the nearest hundred            (b) to the nearest thousand            (c) to the nearest one.</p> <p>33. Round to the nearest hundred to estimate.            (a) The attendance at 2 hockey games was 2489 and 1821. About how many attended altogether?            (b) Two mountain climbers are at the 1969 m mark on a mountain that is 2415 m tall. How much farther do they have to go?</p> <p>35. Write in our numerals: MDLXVI.</p> <p>37. Write in Roman numerals.            (a) 234 (b) 1983</p>	<p>28. (a) <math>\begin{array}{r} 230\,091 \\ +199\,909 \\ \hline \end{array}</math> (b) <math>\begin{array}{r} 473\,000 \\ -173\,906 \\ \hline \end{array}</math></p> <p>30. Give the meaning of each underlined digit. 6<u>5</u>1 <u>4</u>23.<u>9</u><u>6</u><u>1</u></p> <p>32. Round 5364.62:            (a) to the nearest hundred            (b) to the nearest thousand            (c) to the nearest one.</p> <p>34. Round to the nearest hundred to estimate.            (a) The number of cars in a traffic check was 4411 on Monday and 2994 on Tuesday. How many cars were checked altogether?            (b) A rancher has 3119 head of cattle altogether. There are 1882 in the home pasture and the balance in range pasture. How many are in range pasture?</p> <p>36. Write in our numerals: CMXCIX.</p> <p>38. Write in Roman numerals.            (a) 562 (b) 2347</p>
40	<p>39. How many            (a) faces            (b) edges            (c) corners?</p>  <p>41. Complete this rectangular prism.</p>  <p>43. Each of three horses has a mass of 520 kg. The fourth has a mass of 210 kg. What is the total mass of the four horses?</p>	<p>40. How many            (a) faces            (b) edges            (c) corners?</p>  <p>42. Complete the rectangular prism.</p>  <p>44. Jackie had 320 bales of hay. She fed 2 bales a day for 113 d. How many bales did she have left?</p>



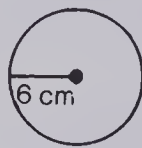
- 50 45. Name the angle two ways.



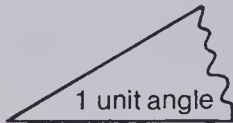
47. Which is a ray?



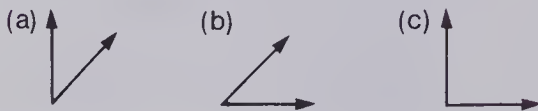
49. What is the diameter of the circle?



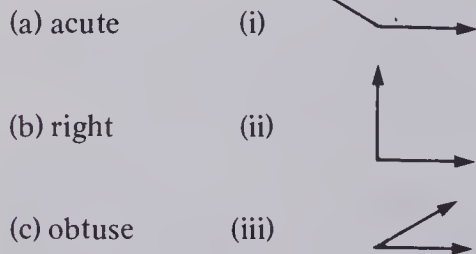
51. Trace and cut out this unit angle.  
Use it to draw an angle  
with a measure of 3 units.



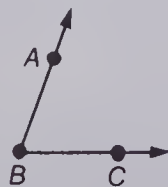
53. Which angles are congruent?



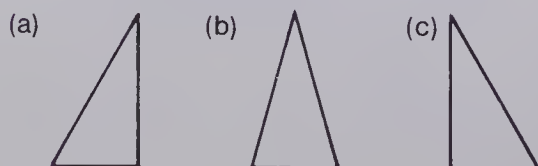
55. Match.



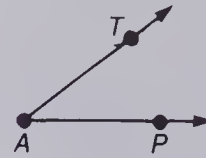
- 60 57. Use a protractor. What is the  
measure of  $\angle ABC$ ?



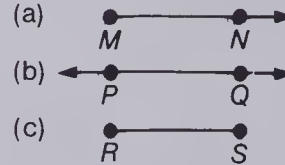
59. Which triangles are congruent?



46. Name the angle two ways.



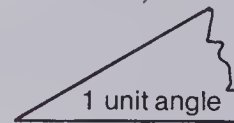
48. Which is a ray?



50. What is the radius of the circle?



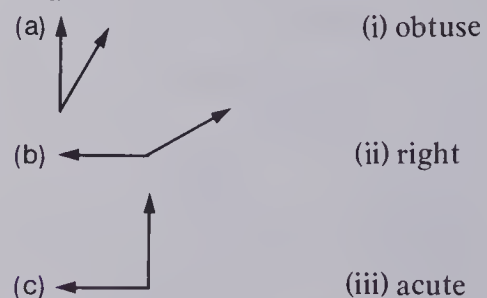
52. Trace and cut out this unit angle.  
Use it to draw an angle  
with a measure of 2 units.



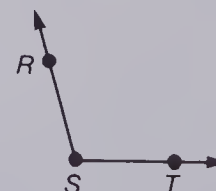
54. Which angles are congruent?



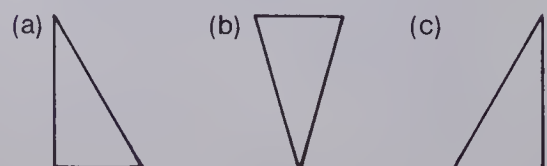
56. Match.

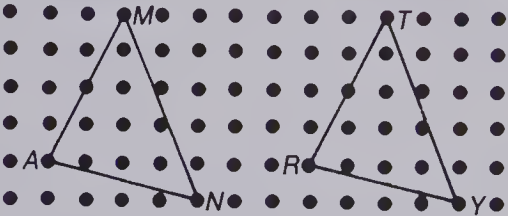
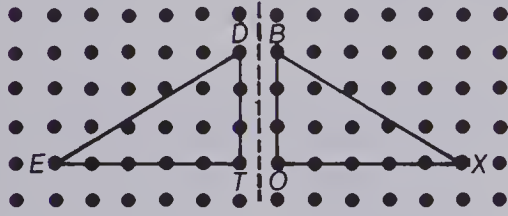
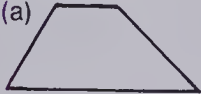


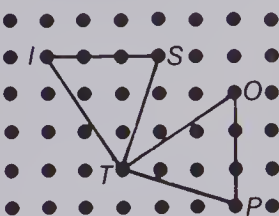
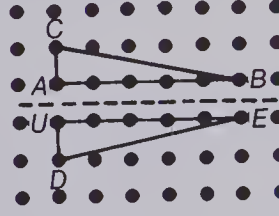


58. Use a protractor. What is the  
measure of  $\angle RST$ ?



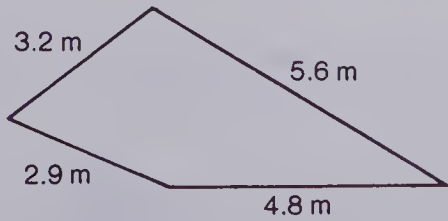
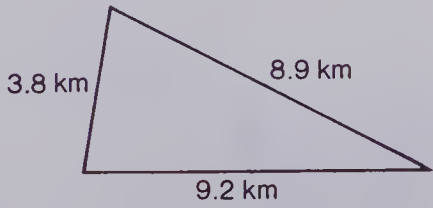
60. Which triangles are congruent?

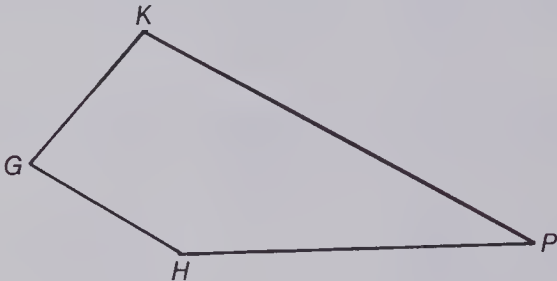
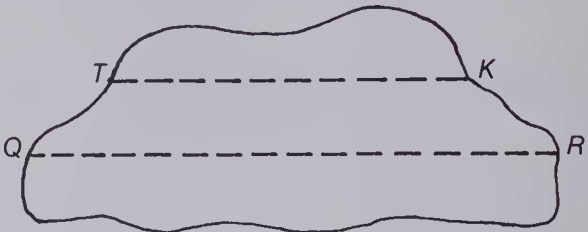



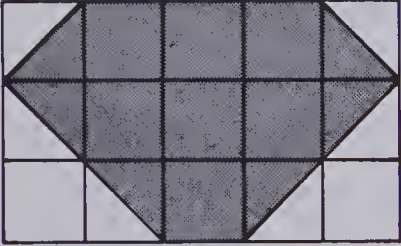

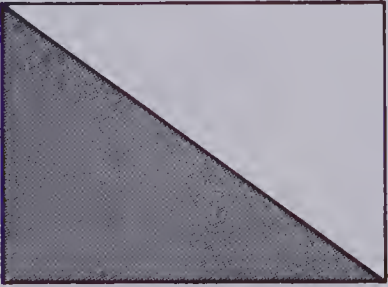
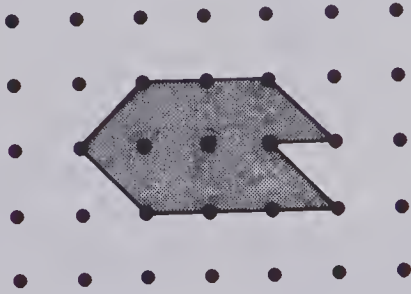

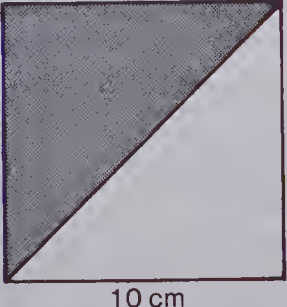
Page	A	B
	<p>61. Name the matching vertices.</p>  <p>63. Name the matching sides.</p>  <p>65. Draw a pair of parallel lines.</p> <p>67. Which of these is a parallelogram?</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;"> <p>(a)</p>  </div> <div style="text-align: center;"> <p>(c)</p>  </div> <div style="text-align: center;"> <p>(b)</p>  </div> </div> <p>69. Draw a cone.</p> <p>71. Draw a circle with a radius of 4 cm.</p>	<p>62. Name the matching vertices.</p>  <p>64. Name the matching sides.</p>  <p>66. Draw a pair of lines which intersect.</p> <p>68. Draw a parallelogram.</p> <p>70. Draw a cylinder.</p> <p>72. Draw a circle with a diameter of 10 cm.</p>
68	<p>73. A large box of popcorn costs 75¢ and a small one costs 50¢. How much do 2 large and 3 small boxes cost?</p> <p>75. Draw a picture to illustrate the problem. Then solve. Bob's horse is 1.9 m tall. Jill's horse is 1.7 m tall. How much taller is Bob's horse?</p> <p>77. Round to the nearest ten dollars, then approximate the answer. Jane's jacket cost \$52.53. Her shoes cost \$38.22. About how much did the two cost together?</p> <p>79. Round to nearest thousand, then approximate the answer. There were 23 870 fingerlings planted in Bear Lake. It is estimated that 2560 did not survive. How many survived?</p> <p>81. Multiply. <math>276 \times 1000</math></p>	<p>74. A hot dog costs 50¢ and a lemonade costs 35¢. How much do 3 hot dogs and 4 lemonades cost?</p> <p>76. Draw a picture to illustrate the problem. Then solve. Bill and Sue run 5 km each day. They ran 1.7 km before breakfast and 2.1 km after lunch. How much farther do they have to run?</p> <p>78. Round to the nearest ten dollars, then approximate the answer. John's basketball cost \$42.50, and his shoes cost \$36.41. About how much did the two items cost?</p> <p>80. Round to the nearest thousand, then approximate the answer. An airplane is due for a checkup after another 35 280 km. It then travels 8721 km. How much farther does it have to go before the checkup is due?</p> <p>82. Multiply. <math>14 \times 100</math></p>
80	<p>83. Write each as a numeral.</p> <p>(a) <math>(3 \times 1000) + (6 \times 100) + (2 \times 10) + (4 \times 1)</math></p> <p>(b) <math>(2 \times 1000) + 0 + (6 \times 10) + (7 \times 1)</math></p>	<p>84. Write each as a numeral.</p> <p>(a) <math>(5 \times 1000) + (9 \times 100) + (1 \times 10) + (3 \times 1)</math></p> <p>(b) <math>(9 \times 1000) + 0 + 0 + (1 \times 1)</math></p>

Page	A	B
	<p>85. Write in expanded form. (a) 4375                      (b) 2003</p> <p>87. (a) <math>\begin{array}{r} 56 \\ \times 8 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 87 \\ \times 9 \\ \hline \end{array}</math></p> <p>89. (a) <math>\begin{array}{r} 438 \\ \times 7 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 802 \\ \times 6 \\ \hline \end{array}</math></p> <p>91. <math>\begin{array}{r} 84\,604 \\ \times 7 \\ \hline \end{array}</math></p> <p>93. Round the larger number to the nearest thousand, then multiply for an estimate. (a) <math>5 \times 8715</math> (b) <math>6 \times 7235</math></p> <p>95. (a) <math>\begin{array}{r} 0.4 \\ \times 4 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 5.8 \\ \times 9 \\ \hline \end{array}</math></p> <p>97. (a) <math>\begin{array}{r} 40.3 \\ \times 6 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 28.7 \\ \times 5 \\ \hline \end{array}</math></p> <p>99. (a) <math>\begin{array}{r} \\$36.45 \\ \times 8 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} \\$499.85 \\ \times 9 \\ \hline \end{array}</math></p>	<p>86. Write in expanded form. (a) 5679                      (b) 8806</p> <p>88. (a) <math>\begin{array}{r} 58 \\ \times 7 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 68 \\ \times 6 \\ \hline \end{array}</math></p> <p>90. (a) <math>\begin{array}{r} 576 \\ \times 8 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 709 \\ \times 9 \\ \hline \end{array}</math></p> <p>92. <math>\begin{array}{r} 50\,423 \\ \times 5 \\ \hline \end{array}</math></p> <p>94. Round the larger number to the nearest thousand, then multiply for an estimate. (a) <math>4 \times 6286</math> (b) <math>9 \times 9824</math></p> <p>96. (a) <math>\begin{array}{r} 4.2 \\ \times 6 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 3.5 \\ \times 8 \\ \hline \end{array}</math></p> <p>98. (a) <math>\begin{array}{r} 83.7 \\ \times 4 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 90.4 \\ \times 7 \\ \hline \end{array}</math></p> <p>100. (a) <math>\begin{array}{r} \\$22.06 \\ \times 6 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} \\$666.66 \\ \times 5 \\ \hline \end{array}</math></p>
90	<p>101. Find the cost of 3 bed lamps each priced at \$35.75.</p> <p>103. (a) <math>\begin{array}{r} 2.089 \\ \times 8 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 7.008 \\ \times 6 \\ \hline \end{array}</math></p> <p>105. Six metal plates, each 3.014 cm thick, are in a pile. How thick is the stack?</p> <p>107. <math>700 \times 600</math></p> <p>109. (a) <math>\begin{array}{r} 87 \\ \times 36 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 39 \\ \times 48 \\ \hline \end{array}</math></p> <p>111. (a) <math>\begin{array}{r} 223 \\ \times 46 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 337 \\ \times 28 \\ \hline \end{array}</math></p> <p>113. (a) <math>\begin{array}{r} 116 \\ \times 231 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 7408 \\ \times 809 \\ \hline \end{array}</math></p>	<p>102. Find the cost of 9 wall hangings each priced at \$84.75.</p> <p>104. (a) <math>\begin{array}{r} 8.603 \\ \times 9 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 9.118 \\ \times 7 \\ \hline \end{array}</math></p> <p>106. Eight wood planks are in a pile stacked one on top of another. Each plank is 2.304 cm thick. How high is the stack?</p> <p>108. <math>800 \times 50</math></p> <p>110. (a) <math>\begin{array}{r} 38 \\ \times 39 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 56 \\ \times 58 \\ \hline \end{array}</math></p> <p>112. (a) <math>\begin{array}{r} 282 \\ \times 51 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 633 \\ \times 38 \\ \hline \end{array}</math></p> <p>114. (a) <math>\begin{array}{r} 743 \\ \times 308 \\ \hline \end{array}</math>                      (b) <math>\begin{array}{r} 6051 \\ \times 278 \\ \hline \end{array}</math></p>
99	<p>115. A ship loaded 6342 bags of coffee beans. Each bag has a mass of 45 kg. What is the total mass of the coffee beans?</p>	<p>116. A small car has a mass of 1.25 t (tonnes). There are 167 of these cars in a ship. How many tonnes are all the cars?</p>



Page	A	B
	<p>117. <math>\begin{array}{r} 41 \\ \times 0.8 \\ \hline \end{array}</math></p> <p>119. (a) <math>\begin{array}{r} 4056 \\ \times 0.4 \\ \hline \end{array}</math> (b) <math>\begin{array}{r} 7348 \\ \times 0.5 \\ \hline \end{array}</math></p> <p>121. (a) <math>\begin{array}{r} 3.51 \\ \times 0.7 \\ \hline \end{array}</math> (b) <math>\begin{array}{r} 3.677 \\ \times 0.8 \\ \hline \end{array}</math></p> <p>123. <math>\begin{array}{r} 7.073 \\ \times 0.52 \\ \hline \end{array}</math></p>	<p>118. <math>\begin{array}{r} 98 \\ \times 0.7 \\ \hline \end{array}</math></p> <p>120. (a) <math>\begin{array}{r} 3095 \\ \times 0.6 \\ \hline \end{array}</math> (b) <math>\begin{array}{r} 7548 \\ \times 0.8 \\ \hline \end{array}</math></p> <p>122. (a) <math>\begin{array}{r} 5.643 \\ \times 0.6 \\ \hline \end{array}</math> (b) <math>\begin{array}{r} 6.49 \\ \times 0.7 \\ \hline \end{array}</math></p> <p>124. <math>\begin{array}{r} 71.2 \\ \times 0.56 \\ \hline \end{array}</math></p>
110	<p>125. <math>7 \overline{)49}</math></p> <p>127. 48 cans of car wax. 6 cans in a case. How many cases?</p> <p>129. (a) <math>6 \overline{)84}</math> (b) <math>5 \overline{)125}</math></p> <p>131. (a) <math>7 \overline{)392}</math> (b) <math>4 \overline{)892}</math></p> <p>133. <math>8096 \div 100</math></p> <p>135. (a) <math>614 \times 0.1</math> (b) <math>614 \div 10</math></p> <p>137. (a) 6 m = ■ cm (b) 150 cm = ■ m</p>	<p>126. <math>8 \overline{)72}</math></p> <p>128. 56 gas tank locks. 7 boxes of locks. How many locks in a box?</p> <p>130. (a) <math>7 \overline{)91}</math> (b) <math>8 \overline{)176}</math></p> <p>132. (a) <math>3 \overline{)267}</math> (b) <math>9 \overline{)2916}</math></p> <p>134. <math>1000 \div 10</math></p> <p>136. (a) <math>49 \div 10</math> (b) <math>49 \times 0.1</math></p> <p>138. (a) 765 cm = ■ m (b) 5.6 m = ■ cm</p>
120	<p>139. (a) 23 dm = ■ m (b) 15 m = ■ dm</p> <p>141. (a) 3.6 m = ■ dm (b) 450 cm = ■ m (c) 2.7 m = ■ cm (d) 3.75 dm = ■ m</p> <p>143. (a) 8900 m = ■ km (b) 0.9 km = ■ m</p> <p>145. Write <math>7 \text{ m} + 0 \text{ dm} + 3 \text{ cm} + 6 \text{ mm}</math> (a) as metres (b) as centimetres.</p> <p>147. Find the perimeter.</p> 	<p>140. (a) 33 m = ■ dm (b) 45 dm = ■ m</p> <p>142. (a) 510 dm = ■ m (b) 4.7 m = ■ dm (c) 667 cm = ■ m (d) 8.5 m = ■ cm</p> <p>144. (a) 6300 m = ■ km (b) 12 km = ■ m</p> <p>146. Write <math>8 \text{ m} + 4 \text{ dm} + 0 \text{ cm} + 2 \text{ mm}</math> (a) as metres (b) as decimetres.</p> <p>148. Find the perimeter.</p> 

Page	A	B
	<p>149. How far is it from <math>H</math> to <math>P</math>?</p> <div>1 cm represents 1 km.</div>  <p>151. Some oil is sold in 500 mL cans. How many of these cans are needed for 6 L of oil?</p> <p>153. (a) <math>1.25\text{ L} = \blacksquare\text{ mL}</math> (b) <math>375\text{ mL} = \blacksquare\text{ L}</math></p> <p>131 155. (a) <math>600\text{ g} = \blacksquare\text{ kg}</math> (b) <math>7.6\text{ kg} = \blacksquare\text{ g}</math></p> <p>157. Name an item that has a mass of about 1 kg.</p> <p>159. (a) <math>2\text{ t} = \blacksquare\text{ kg}</math> (b) <math>3750\text{ kg} = \blacksquare\text{ t}</math></p> <p>161. Which has a mass of about 1 t? (a) dog (b) large bull (c) elephant</p> <p>163. The temperature was <math>17^{\circ}\text{C}</math>. It rose to <math>32.8^{\circ}\text{C}</math>. How much did the temperature rise?</p> <p>165. (a) <math>3\text{ h} = \blacksquare\text{ min}</math> (b) <math>6\text{ d (days)} = \blacksquare\text{ h}</math></p> <p>167. Scott rides his horse 45 min/d every day of the week. How many minutes a year is this?</p> <p>169. What time is it in Toronto when it is 03:00 in Winnipeg? (Winnipeg is 1 time zone different than Toronto.)</p> <p>171. A cow provides about 14 L of milk daily. How many litres of milk would the cow produce in a week?</p> <p>173. Estimate the length in metres of the chalkboard.</p>	<p>150. How far is it from <math>Q</math> to <math>R</math>?</p> <div>1 cm represents 1 km.</div>  <p>152. Mark has 8 cans of oil. Each can is 500 mL. How many litres of oil does Mark have?</p> <p>154. (a) <math>4250\text{ mL} = \blacksquare\text{ L}</math> (b) <math>52\text{ L} = \blacksquare\text{ mL}</math></p> <p>156. (a) <math>8000\text{ g} = \blacksquare\text{ kg}</math> (b) <math>4.3\text{ kg} = \blacksquare\text{ g}</math></p> <p>158. Name an item that has a mass of about 2 kg.</p> <p>160. (a) <math>5\text{ t} = \blacksquare\text{ kg}</math> (b) <math>5280\text{ kg} = \blacksquare\text{ t}</math></p> <p>162. Which has a mass of about 1 t? (a) compact car (b) large truck (c) large bus</p> <p>164. The temperature has risen <math>14.3^{\circ}\text{C}</math> since the overnight low. It is now <math>28.1^{\circ}\text{C}</math>. What was the overnight low?</p> <p>166. (a) <math>6\text{ weeks} = \blacksquare\text{ d (days)}</math> (b) <math>330\text{ min} = \blacksquare\text{ h}</math></p> <p>168. Georgette jogs 30 min/d. How many minutes does she jog in March?</p> <p>170. What time is it in Halifax when it is 18:30 in Edmonton? (Halifax is 3 time zones from Edmonton.)</p> <p>172. Matt's slot car makes 1 lap in 20 s. How many laps does it make in 2 min?</p> <p>174. Estimate the length in centimetres of this segment.</p>  <p>140 175. <math>350 \div 50</math></p> <p>176. <math>480 \div 60</math></p> <p>177. <math>27 \overline{)108}</math></p> <p>178. <math>68 \overline{)272}</math></p>

Page	A	B
	<p>179. <math>37 \overline{)259}</math></p> <p>181. <math>64 \overline{)3456}</math></p> <p>183. There are 768 bottles in 32 cases. How many bottles to a case?</p>	<p>180. <math>48 \overline{)384}</math></p> <p>182. <math>78 \overline{)2496}</math></p> <p>184. There are 1058 chairs in 46 rows. How many rows?</p>
150	<p>185. (a) <math>22 \overline{)528}</math> (b) <math>41 \overline{)5043}</math></p> <p>187. <math>7 \overline{)2835}</math></p> <p>189. <math>26 \overline{)5356}</math></p> <p>191. Divide and check. <math>7 \overline{)161}</math></p> <p>193. (a) <math>8 \overline{)435}</math> (b) <math>28 \overline{)678}</math></p> <p>195. Divide and check. (a) <math>4 \overline{)187}</math> (b) <math>38 \overline{)1000}</math></p> <p>197. A structure has a mass of 4224 kg. Each of the 32 parts have the same mass. What is the mass of each part?</p>	<p>186. (a) <math>31 \overline{)1674}</math> (b) <math>26 \overline{)6006}</math></p> <p>188. <math>8 \overline{)6416}</math></p> <p>190. <math>47 \overline{)4935}</math></p> <p>192. Divide and check. <math>33 \overline{)1815}</math></p> <p>194. (a) <math>9 \overline{)249}</math> (b) <math>42 \overline{)838}</math></p> <p>196. Divide and check. (a) <math>7 \overline{)244}</math> (b) <math>29 \overline{)1588}</math></p> <p>198. An engine component was heated to <math>325^{\circ}\text{C}</math>. It was then cooled to <math>25^{\circ}\text{C}</math>. How many degrees did the temperature drop?</p>
163	<p>199. What is the area of the shaded portion?</p>  <p>201. Find the area of the rectangle.</p>  <p>203. Find the area of the shaded triangle.</p> 	<p>200. What is the area of the shaded portion?</p>  <p>202. Find the area of the rectangle.</p>  <p>204. Find the area of the shaded triangle.</p> 

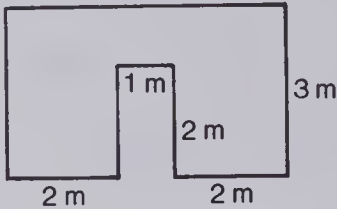


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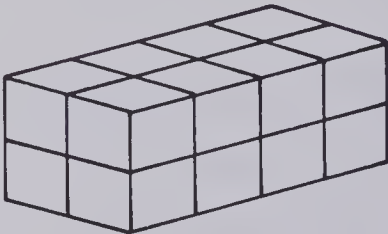
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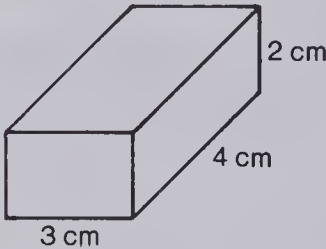
205. How many square metres?



207. How many cubes?



209. Find the volume.



211. Solve.

(a)  $8 \times \blacksquare = 32$

(b)  $9 - M = 3$

213. True or false?

$3 \times 9 > 5 \times 6$

215. Solve.  $3 + T < 6$

217. Solve and graph the solution on a number line.

(a)  $4 \times N < 12$

(b)  $3 \times 2 > T$

219. Write a number sentence that fits the problem. Solve.

Mr. Herb sold 33 bicycle lights.

Seven of the lights were returned.

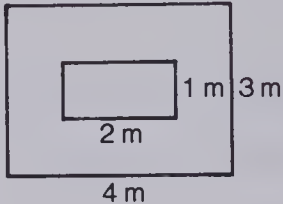
How many lights were not returned?

221. Mercury is 58 000 000 km from the Sun. Saturn is 1 414 000 000 km from the Sun. When they are both on the same side of the Sun, how far apart are they?

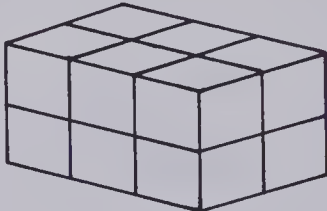
223. Draw a pictograph for this data.

Canadian Imports From Some Countries	
Australia	\$330 000 000
Hong Kong	\$130 000 000
Sweden	\$230 000 000
Mexico	\$120 000 000

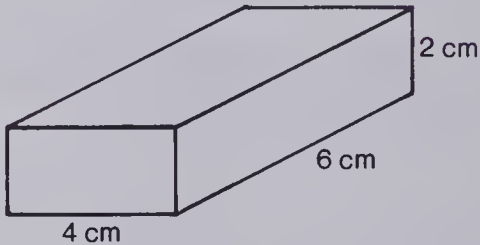
206. How many square metres?



208. How many cubes?



210. Find the volume.



212. Solve.

(a)  $12 \div \blacktriangle = 3$

(b)  $5 + N = 12$

214. True or false?

$67 < 9 \times 7$

216. Solve.  $\blacktriangle \times 4 < 10$

218. Solve and graph the solution on a number line.

(a)  $6 + N < 11$

(b)  $12 \div 3 > N$

220. Write a number sentence that fits the problem. Solve.

Ms. Exner received 8 boxes of batteries.






Each box had 4 batteries.

How many batteries were received?

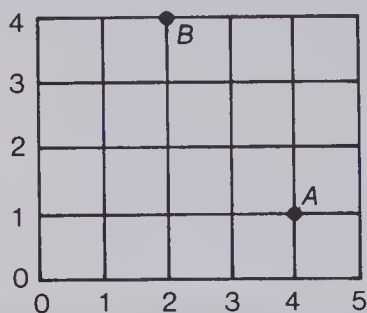
222. Neptune is 5 880 000 000 km from the Sun. Venus is 107 000 000 km from the Sun. When they are on opposite sides of the Sun, how far apart are they?

224. Draw a pictograph for this data.

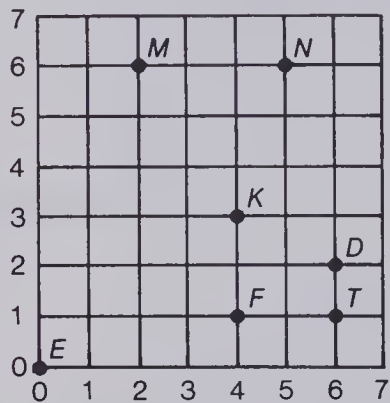
Number of People Using Each Language	
Mandarin	640 000 000
English	370 000 000
Russian	260 000 000
Spanish	230 000 000

Page	A	B																												
195	<p>225. Draw a bar graph to illustrate this data.</p> <table><tr><th colspan="2">Immigrants to Canada by Country</th></tr><tr><td>United Kingdom</td><td>66 000</td></tr><tr><td>United States</td><td>52 000</td></tr><tr><td>Portugal</td><td>30 000</td></tr><tr><td>Hong Kong</td><td>28 000</td></tr></table>	Immigrants to Canada by Country		United Kingdom	66 000	United States	52 000	Portugal	30 000	Hong Kong	28 000	<p>226. Draw a bar graph to illustrate this data.</p> <table><tr><th colspan="2">Number of Pelts Taken</th></tr><tr><td>Weasel</td><td>55 968</td></tr><tr><td>Coyote</td><td>87 139</td></tr><tr><td>Fox</td><td>124 600</td></tr><tr><td>Mink</td><td>68 425</td></tr></table>	Number of Pelts Taken		Weasel	55 968	Coyote	87 139	Fox	124 600	Mink	68 425								
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	<p>227. Draw a broken line graph to illustrate this data.</p> <table><tr><th colspan="2">Population of Ontario</th></tr><tr><td>1951</td><td>4 970 000</td></tr><tr><td>1961</td><td>6 240 000</td></tr><tr><td>1971</td><td>7 700 000</td></tr><tr><td>1981</td><td>8 940 000</td></tr></table>	Population of Ontario		1951	4 970 000	1961	6 240 000	1971	7 700 000	1981	8 940 000	<p>228. Draw a broken line graph to illustrate this data.</p> <table><tr><th colspan="2">Population of British Columbia</th></tr><tr><td>1950</td><td>1 250 000</td></tr><tr><td>1960</td><td>1 330 000</td></tr><tr><td>1970</td><td>1 625 000</td></tr><tr><td>1980</td><td>2 250 000</td></tr></table>	Population of British Columbia		1950	1 250 000	1960	1 330 000	1970	1 625 000	1980	2 250 000								
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	<p>229. Complete the table.</p> <table><tr><th>Input</th><th>Output</th></tr><tr><td>3</td><td>8.1</td></tr><tr><td>4</td><td>9.1</td></tr><tr><td>5</td><td>10.1</td></tr><tr><td>6</td><td>■</td></tr><tr><td>10</td><td>■</td></tr><tr><td>15.5</td><td>■</td></tr></table>	Input	Output	3	8.1	4	9.1	5	10.1	6	■	10	■	15.5	■	<p>230. Complete the table.</p> <table><tr><th>Input</th><th>Output</th></tr><tr><td>1</td><td>2.1</td></tr><tr><td>2</td><td>4.2</td></tr><tr><td>3</td><td>6.3</td></tr><tr><td>5</td><td>■</td></tr><tr><td>10</td><td>■</td></tr><tr><td>20</td><td>■</td></tr></table>	Input	Output	1	2.1	2	4.2	3	6.3	5	■	10	■	20	■
Input	Output																													
3	8.1																													
4	9.1																													
5	10.1																													
6	■																													
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15.5	■																													
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1	2.1																													
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20	■																													
	<p>231. Complete the table.</p> <table><tr><th colspan="2">Rule: multiply by 3 and add 5.</th></tr><tr><th>Input</th><th>Output</th></tr><tr><td>1</td><td>■</td></tr><tr><td>2</td><td>■</td></tr><tr><td>5</td><td>■</td></tr><tr><td>10</td><td>■</td></tr></table>	Rule: multiply by 3 and add 5.		Input	Output	1	■	2	■	5	■	10	■	<p>232. Complete the table.</p> <table><tr><th colspan="2">Rule: multiply by 5 and subtract 6.</th></tr><tr><th>Input</th><th>Output</th></tr><tr><td>2</td><td>■</td></tr><tr><td>3</td><td>■</td></tr><tr><td>5</td><td>■</td></tr><tr><td>10</td><td>■</td></tr></table>	Rule: multiply by 5 and subtract 6.		Input	Output	2	■	3	■	5	■	10	■				
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	<p>233. Complete the table for the distance travelled by an airplane. travelling 800 km/h.</p> <table><tr><td>Hours</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>Kilometres</td><td></td><td></td><td></td><td></td><td></td></tr></table>	Hours	1	2	3	4	5	Kilometres						<p>234. Complete the table for the distance travelled by a car travelling 110 km/h.</p> <table><tr><td>Hours</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>Kilometres</td><td></td><td></td><td></td><td></td><td></td></tr></table>	Hours	1	2	3	4	5	Kilometres									
Hours	1	2	3	4	5																									
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	<p>235. Draw</p> <p>(a) a vertical line</p> <p>(b) a horizontal line.</p>	<p>236. Identify each as a vertical line, a horizontal line, or neither.</p> <p>(a)  (b)  (c)  (d)  (e) </p>																												

237. Name the ordered pair for each letter.



239. Which letter is identified by (6,2)? (2,6)? (4,3)? (0,0)?



210 241.  $345 + 0$

243. Copy and complete.  
 $56 + 44 = 56 + (40 + \blacksquare)$   
 $= (56 + 40) + \blacksquare$   
 $= \blacksquare + \blacksquare$   
 $= \blacksquare$

245.  $344 \times 0 \times 44$

247.  $0 \div 90$

249.  $4 \div 0$

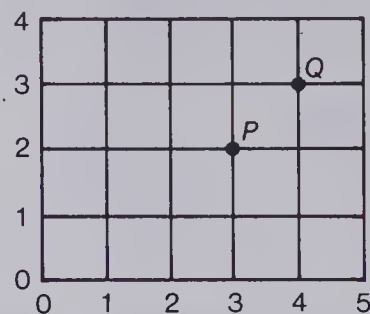
251. Copy and complete.  
 $4 \times 48 = 4 \times (40 + \blacksquare)$   
 $= 4 \times 40 + 4 \times \blacksquare$   
 $= \blacksquare + \blacksquare$   
 $= \blacksquare$

253. The total rainfall for 3 d was 118 mm. 53 mm fell on the first day, and 29 mm fell on the second day. How much fell on the third day?

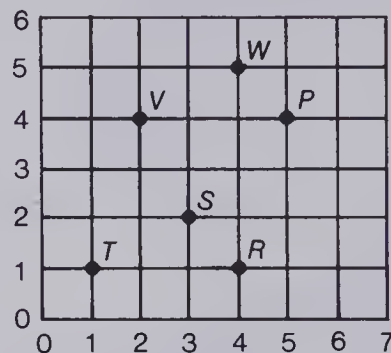
255. Which are divisible by:  
 (a) 3 (b) 9 (c) 10?  
 (i) 73 (ii) 6920 (iii) 1566 (iv) 6633

220 257. Which number is the product in  $4 \times 9 = 36$ ?

238. Name the ordered pair for each letter.



240. Which letter is identified by (4,5)? (2,4)? (4,2)? (5,4)?



242.  $0 + 492$

244. Copy and complete.  
 $46 + 94 = (\blacksquare + 6) + 94$   
 $= \blacksquare + (6 + 94)$   
 $= \blacksquare + \blacksquare$   
 $= \blacksquare$

246.  $0 \times 954 \times 67$

248.  $0 \div 344$

250.  $99 \div 0$

252. Copy and complete.  
 $9 \times 73 = 9 \times (70 + \blacksquare)$   
 $= 9 \times 70 + 9 \times \blacksquare$   
 $= \blacksquare + \blacksquare$   
 $= \blacksquare$

254. The total snowfall for 3 d was 14.4 cm. Equal amounts fell on each day. How much snow fell each day?

256. Which are divisible by:  
 (a) 5 (b) 4 (c) 9?  
 (i) 35 (ii) 7342 (iii) 79 515 (iv) 7533

258. Which number is the product in  $27 = 3 \times 9$ ?



Page	A	B
	<p><b>259.</b> Draw a factor tree for 48.</p> <p><b>261.</b> Identify each as a prime or composite number. (a) 17 (b) 27 (c) 8 (d) 3</p> <p><b>263.</b> What are the common factors of 30 and 12?</p> <p><b>265.</b> What is the greatest common factor of 12 and 40?</p> <p><b>267.</b> Write 4 multiples of 7.</p>	<p><b>260.</b> Draw a factor tree for 90.</p> <p><b>262.</b> Identify each as a prime or composite number. (a) 5 (b) 4 (c) 11 (d) 21</p> <p><b>264.</b> What are the common factors of 24 and 70?</p> <p><b>266.</b> What is the greatest common factor of 27 and 18?</p> <p><b>268.</b> Write 4 multiples of 8.</p>
228	<p><b>269.</b> What are three common multiples of 3 and 5?</p> <p><b>271.</b> What is the least common multiple of 4 and 20?</p> <p><b>273.</b> Copy and complete. <math>10^2 = \blacksquare \times \blacksquare</math></p> <p><b>275.</b> Write 1000 in exponent form.</p> <p><b>277.</b> Cherry pie filling is regularly \$1.85 a can. On sale, it is \$1.39. How much is saved on 6 cans?</p>	<p><b>270.</b> What are three common multiples of 4 and 10?</p> <p><b>272.</b> What is the least common multiple of 8 and 10?</p> <p><b>274.</b> Copy and complete. <math>10^3 = \blacksquare</math></p> <p><b>276.</b> Write 100 000 in exponent form.</p> <p><b>278.</b> Green peas are regularly 69¢ a can. On sale, the price is 3 for \$1.49. How much is saved on a dozen cans of green peas?</p>
240	<p><b>279.</b> Identify the denominator in <math>\frac{3}{5}</math>.</p> <p><b>281.</b> <math>\frac{1}{6}</math> of 72 is <math>\blacksquare</math>.</p> <p><b>283.</b> <math>\frac{2}{3}</math> of 15 is <math>\blacksquare</math>.</p> <p><b>285.</b> Use <math>&gt;</math>, <math>=</math>, or <math>&lt;</math> to complete each. (a) <math>\frac{1}{3} \bullet \frac{1}{5}</math> (b) <math>\frac{3}{6} \bullet \frac{4}{6}</math></p> <p><b>287.</b> (a) <math>\frac{3}{8} + \frac{1}{8}</math> (b) <math>\frac{7}{10} - \frac{3}{10}</math></p> <p><b>289.</b> (a) <math>\frac{6}{8} + \frac{4}{8}</math> (b) <math>\frac{3}{10} + \frac{9}{10}</math></p> <p><b>291.</b> Write the decimal equivalent for each. (a) <math>\frac{7}{10}</math> (b) <math>\frac{715}{1000}</math></p> <p><b>293.</b> Write the fraction equivalent for each. (a) 0.4 (b) 0.278</p> <p><b>295.</b> Which are improper fractions? (a) <math>\frac{5}{8}</math> (b) <math>\frac{7}{5}</math> (c) <math>\frac{12}{13}</math> (d) <math>\frac{15}{8}</math></p>	<p><b>280.</b> Identify the numerator in <math>\frac{7}{9}</math>.</p> <p><b>282.</b> <math>\frac{1}{5}</math> of 75 is <math>\blacksquare</math>.</p> <p><b>284.</b> <math>\frac{5}{6}</math> of 24 is <math>\blacksquare</math>.</p> <p><b>286.</b> Use <math>&gt;</math>, <math>=</math>, or <math>&lt;</math> to complete each. (a) <math>\frac{1}{2} \bullet \frac{1}{4}</math> (b) <math>\frac{3}{8} \bullet \frac{5}{8}</math></p> <p><b>288.</b> (a) <math>\frac{4}{10} + \frac{2}{10}</math> (b) <math>\frac{5}{6} - \frac{1}{6}</math></p> <p><b>290.</b> (a) <math>\frac{2}{5} + \frac{4}{5}</math> (b) <math>\frac{7}{9} + \frac{4}{9}</math></p> <p><b>292.</b> Write the decimal equivalent for each. (a) <math>\frac{3}{10}</math> (b) <math>\frac{61}{100}</math></p> <p><b>294.</b> Write the fraction equivalent for each. (a) 0.9 (b) 0.156</p> <p><b>296.</b> Which are improper fractions? (a) <math>\frac{3}{4}</math> (b) <math>\frac{14}{15}</math> (c) <math>\frac{5}{2}</math> (d) <math>\frac{16}{3}</math></p>

250

297. Complete to form an equivalent fraction.

$$\frac{3}{4} = \frac{\blacksquare}{28}$$

299. Express in lowest terms.

$$\frac{18}{24}$$

301. Use = or  $\neq$  for each.

$$(a) \frac{2}{3} \bullet \frac{10}{15} \quad (b) \frac{3}{5} \bullet \frac{10}{18}$$

303. Complete to form equivalent fractions.

$$(a) \frac{4}{10} = \frac{N}{30} \quad (b) \frac{2}{3} = \frac{12}{M}$$

305. Express as a mixed numeral.

$$\frac{21}{6}$$

307. Find a common denominator for the two fractions.

$$\frac{1}{3} \text{ and } \frac{3}{4}$$

$$\begin{array}{r} 309. \quad \frac{2}{9} \\ + \frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 311. \quad \frac{5}{8} \\ - \frac{1}{6} \\ \hline \end{array}$$

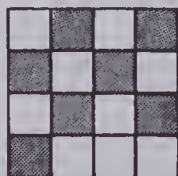
313. Find the least common denominator for  $\frac{3}{4}$  and  $\frac{7}{10}$ .

$$\begin{array}{r} 315. \quad 1 \frac{2}{5} \\ + 3 \frac{1}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 317. \quad 3 \frac{3}{4} \\ - 1 \frac{3}{8} \\ \hline \end{array}$$

261

319. What is the ratio of the shaded to the unshaded portions?



321. Express each as a decimal.

$$(a) \frac{3}{5} \quad (b) \frac{13}{20}$$

323. Write each as a percent.

$$(a) \frac{7}{10} \quad (b) \frac{11}{25}$$

298. Complete to form an equivalent fraction.

$$\frac{4}{5} = \frac{\blacksquare}{30}$$

300. Express in lowest terms.

$$\frac{12}{18}$$

302. Use = or  $\neq$  for each.

$$(a) \frac{3}{7} \bullet \frac{9}{21} \quad (b) \frac{7}{8} \bullet \frac{10}{12}$$

304. Complete to form equivalent fractions.

$$(a) \frac{2}{7} = \frac{8}{N} \quad (b) \frac{5}{6} = \frac{M}{42}$$

306. Express as a mixed numeral.

$$\frac{25}{8}$$

308. Find a common denominator for the two fractions.

$$\frac{2}{5} \text{ and } \frac{1}{3}$$

$$\begin{array}{r} 310. \quad \frac{3}{5} \\ + \frac{1}{4} \\ \hline \end{array}$$

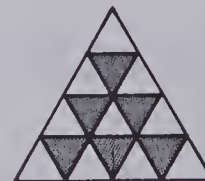
$$\begin{array}{r} 312. \quad \frac{9}{10} \\ - \frac{1}{3} \\ \hline \end{array}$$

314. Find the least common denominator for  $\frac{5}{6}$  and  $\frac{11}{12}$ .

$$\begin{array}{r} 316. \quad 3 \frac{3}{4} \\ + 2 \frac{1}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 318. \quad 7 \frac{3}{5} \\ - 2 \frac{1}{4} \\ \hline \end{array}$$

320. What is the ratio of the shaded to the unshaded portions?



322. Express each as a decimal.

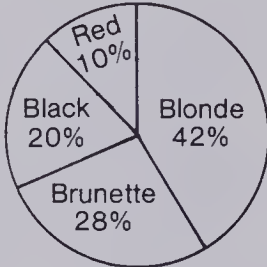
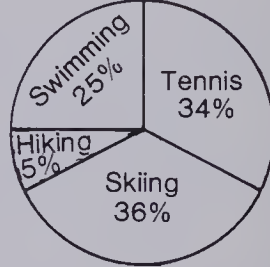
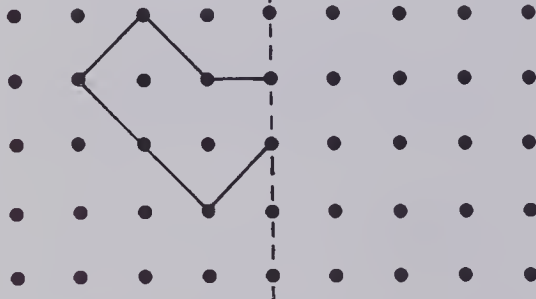
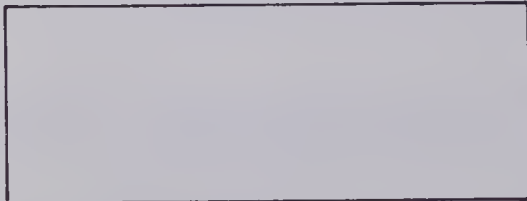
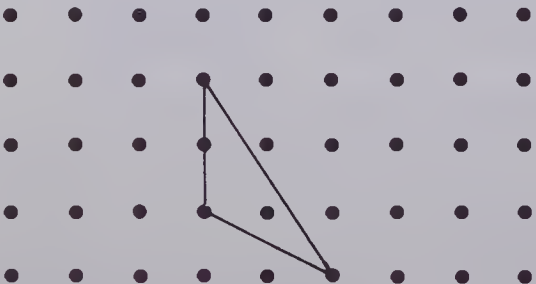
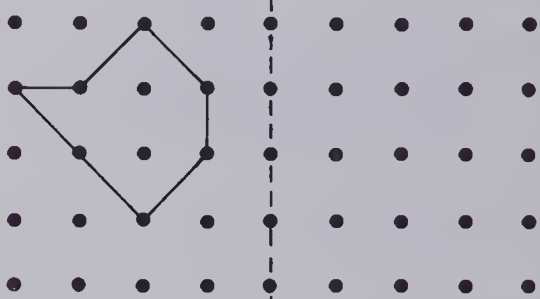

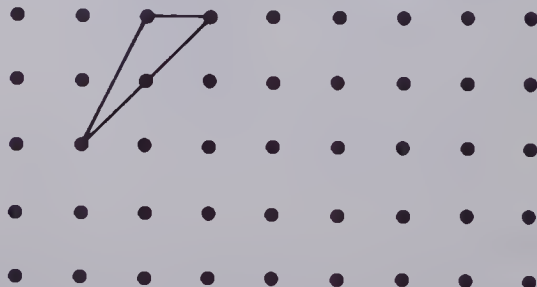
$$(a) \frac{5}{8} \quad (b) \frac{7}{25}$$

324. Write each as a percent.

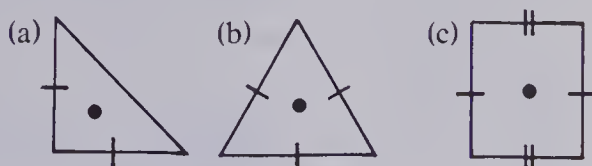
$$(a) \frac{14}{50} \quad (b) \frac{3}{20}$$

Page	A	B
	<p>325. 8 is what percent of 25?</p> <p>327. Write each as a decimal. (a) 30% (b) 55%</p> <p>329. 40% of \$50 = ■</p> <p>331. 14 homes in a subdivision of 50 homes have garages. What percent have garages?</p> <p>333. Of the 60 homes in a subdivision, 40% have two bathrooms. How many have bathrooms?</p>	<p>326. 12 is what percent of 50?</p> <p>328. Write each as a decimal. (a) 20% (b) 75%</p> <p>330. 30% of \$60 = ■</p> <p>332. Of the 20 homes in a subdivision, 8 have fireplaces. What percent have fireplaces?</p> <p>334. Of the 80 homes in a subdivision, 35% have air conditioning. How many have air conditioning?</p>
270	<p>335. <math display="block">\begin{array}{r} 436.47 \\ +956.32 \\ \hline \end{array}</math></p> <p>337. <math display="block">\begin{array}{r} 735\,410 \\ -217\,008 \\ \hline \end{array}</math></p> <p>339. (a) <math display="block">\begin{array}{r} 620 \\ \times 37 \\ \hline \end{array}</math> (b) <math display="block">\begin{array}{r} 245 \\ \times 0.3 \\ \hline \end{array}</math></p> <p>341. (a) <math>4 \overline{)95}</math> (b) <math>27 \overline{)6679}</math></p> <p>343. Estimate first, then calculate. One fishing boat caught 37 t of fish. Another caught 19 t. How much did the two catch?</p> <p>345. Estimate by rounding up. <math>67 \times 35</math></p>	<p>336. <math display="block">\begin{array}{r} 435.41 \\ +275.03 \\ \hline \end{array}</math></p> <p>338. <math display="block">\begin{array}{r} 740\,056 \\ -239\,449 \\ \hline \end{array}</math></p> <p>340. (a) <math display="block">\begin{array}{r} 304 \\ \times 69 \\ \hline \end{array}</math> (b) <math display="block">\begin{array}{r} 504 \\ \times 0.8 \\ \hline \end{array}</math></p> <p>342. (a) <math>6 \overline{)123}</math> (b) <math>39 \overline{)11\,877}</math></p> <p>344. Estimate first, then calculate. There were 3754 kg of salmon caught. It is worth \$8.15/kg. How much is the catch worth?</p> <p>346. Estimate by rounding down. <math>73 \times 21</math></p>
280	<p>347. Estimate, then calculate. An electronic scoreboard has 64 columns of lights across and 48 lights in each column. How many lights altogether?</p> <p>349. Use short division. (a) <math>9 \overline{)405}</math> (b) <math>7 \overline{)1421}</math></p> <p>351. Divide and check. (a) <math>7 \overline{)23.1}</math> (b) <math>24 \overline{)1111.2}</math></p> <p>353. (a) <math>31 \overline{)100.75}</math> (b) <math>26 \overline{)37.96}</math></p> <p>355. Insert brackets to make the sentence true. <math>6 + 8 \div 2 = 7</math></p>	<p>348. Estimate, then calculate. 48 boxes of pop were ordered. Each box has 24 cans. How many cans of pop were ordered?</p> <p>350. Use short division. (a) <math>8 \overline{)456}</math> (b) <math>6 \overline{)2478}</math></p> <p>352. Divide and check. (a) <math>5 \overline{)24.5}</math> (b) <math>32 \overline{)1043.2}</math></p> <p>354. (a) <math>27 \overline{)89.37}</math> (b) <math>19 \overline{)78.66}</math></p> <p>356. Insert brackets to make the sentence true. <math>36 \div 6 - 4 = 2</math></p>
293	<p>357. <math>12 - 4 \div 4</math></p> <p>359. <math>(6 + 8) \div 7 - 2</math></p>	<p>358. <math>21 \times 3 + 6 - 2</math></p> <p>360. <math>36 \div (4 + 2) + 6</math></p>

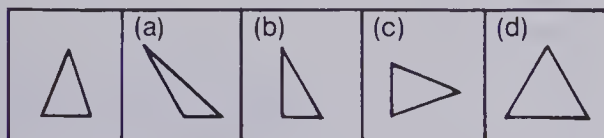


Page	A	B																												
	<p><b>361.</b> Find the average of these four numbers. 42    37    56    81</p> <p><b>363.</b> What percent of the students have red hair?</p> <p>Colour of Hair of Students</p> 	<p><b>362.</b> Find the average of these five numbers. 74    23    74    95    44</p> <p><b>364.</b> What percent of the students chose tennis?</p> <p>Sports Chosen by Students</p> 																												
295	<p><b>365.</b> Draw a broken line graph for the temperature on a summer day.</p> <table border="1"><thead><tr><th>Time</th><th>Temperature</th></tr></thead><tbody><tr><td>06:00</td><td>4°C</td></tr><tr><td>08:00</td><td>8°C</td></tr><tr><td>10:00</td><td>14°C</td></tr><tr><td>12:00</td><td>22°C</td></tr><tr><td>14:00</td><td>24°C</td></tr><tr><td>16:00</td><td>12°C</td></tr></tbody></table>	Time	Temperature	06:00	4°C	08:00	8°C	10:00	14°C	12:00	22°C	14:00	24°C	16:00	12°C	<p><b>366.</b> Draw a broken line graph for the distance of a glider above ground level.</p> <table border="1"><thead><tr><th>Time</th><th>Height</th></tr></thead><tbody><tr><td>0</td><td>1000 m</td></tr><tr><td>15 min</td><td>1500 m</td></tr><tr><td>30 min</td><td>750 m</td></tr><tr><td>45 min</td><td>1250 m</td></tr><tr><td>60 min</td><td>1400 m</td></tr><tr><td>75 min</td><td>500 m</td></tr></tbody></table>	Time	Height	0	1000 m	15 min	1500 m	30 min	750 m	45 min	1250 m	60 min	1400 m	75 min	500 m
Time	Temperature																													
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45 min	1250 m																													
60 min	1400 m																													
75 min	500 m																													
310	<p><b>367.</b> Copy and draw the flip image.</p>  <p><b>369.</b> How many lines of symmetry has this shape?</p>  <p><b>371.</b> Draw the slide: 1 up and 2 left.</p> 	<p><b>368.</b> Copy and draw the flip image.</p>  <p><b>370.</b> How many lines of symmetry has this shape?</p>  <p><b>372.</b> Draw the slide: 2 down and 3 right.</p> 																												

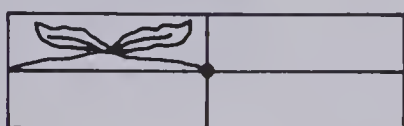
373. Which shape matches itself in a half turn?



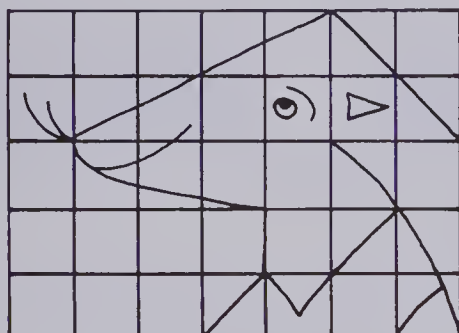
321 375. Which shapes match the first one? Do you need a slide, flip, or turn?



377. Use this pattern to make a slide followed by a flip pattern.



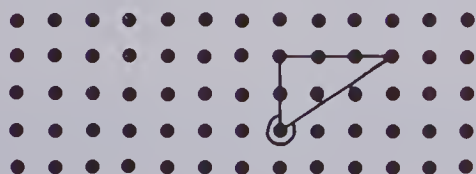
379. Make an enlargement of this design.



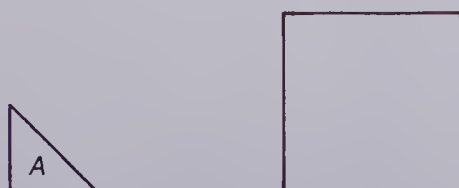
381. Name the matching vertices.



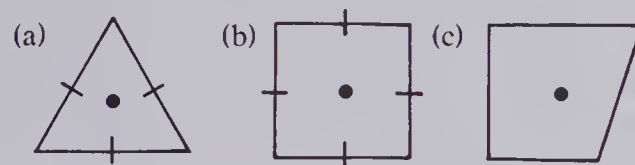
383. Draw a  $\frac{1}{4}$  turn.



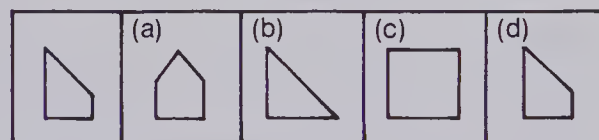
385. Will the shape A fill the rectangle without leaving spaces?



374. Which shape matches itself in a  $\frac{1}{4}$  turn?



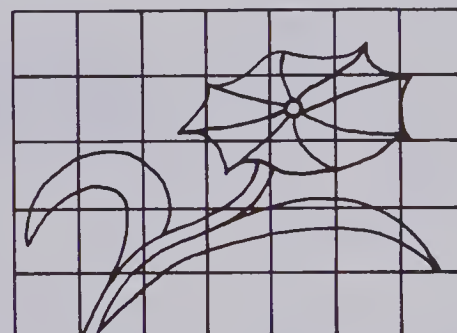
376. Which shape matches the first one? Do you need a slide, flip, or turn?



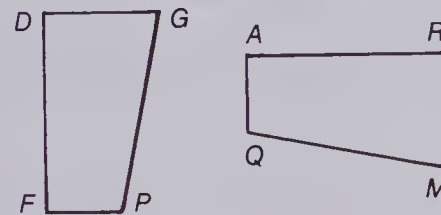
378. Use this pattern to make a  $\frac{1}{4}$  turn followed by a flip.



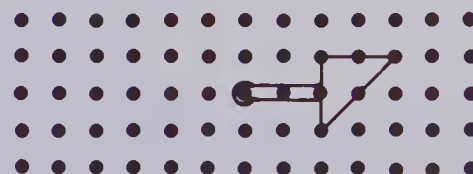
380. Make an enlargement of this design.



382. Name the matching vertices.



384. Draw a  $\frac{1}{2}$  turn.



386. Will the shape B fill the rectangle without leaving spaces?



# CHAPTER 1 OVERVIEW

This chapter emphasizes numeration in our base 10 number system. Place-value skills are developed using numerals whose value extends from hundred millions to thousandths. Such skills include reading, meaning, expanded notation, and place-value charts. Procedures are developed for comparing and rounding numbers.

Addition and subtraction algorithms are reviewed and extended, and translation of Roman to our modern numerals is explored. Problem-solving skills are also developed and extended.

## OBJECTIVES

- A To solve simple number sentences
- B To round numbers
- C To use various forms to express the place value of whole numbers and decimals
- D To add whole numbers and decimals
- E To subtract whole numbers and decimals
- F To compare numbers
- G To translate Roman to our modern numerals and vice versa

## BACKGROUND

The word-problem lessons in this chapter (pages 4, 5, 8, 18, 19, and 26) attempt to provide an organizational framework within which students can solve these problems. First, Professor Q's four questions are reviewed as a method to organize and clarify data. Next, number sentences are used to provide a device which sets the stage for arriving at a numerical solution to the problem.

You may wish to include your own ideas for a problem-solving format or other techniques that you have found beneficial to students in the problem-solving process. Whatever modifications you wish to make, consider the following guidelines:

1. The student's work should communicate to you (or another student) the process used to solve the problem.

2. The follow-up or final statement should include the correct solution with the appropriate unit or units: kg, \$, books, mL, pencils, etc.

3. Any *necessary* computation is generally considered to be part of the problem-solving format. Incorrect solutions to problems are sometimes caused by mechanical errors, and it is in the computational work that diagnosis and remediation can begin.

What constitutes *necessary* computation is generally a matter of judgment. For example, a solution involving the number phrase  $13 + 5$  could be calculated mentally. On the other hand, a solution involving the phrase  $351 - 128$  might better be calculated using the standard subtraction algorithm. Your decision naturally will be affected by the current level of development of your students. Many teachers include a space or column on the right side of the page for computational work.

### Problem Solving Steps

#### Step 1 Professor Q's Four Questions

Some students who have developed basic organiza-

tional skills may find that writing answers to Professor Q's questions is a burdensome task. Encourage these pupils to deal with the questions mentally. Students with weak organizational skills should write brief answers, but as their skills improve, they also should be encouraged to make the process a mental exercise. The four questions are designed to help students decode a word problem, and as such, they assist students in selecting the appropriate data and operation required for a correct solution.

#### Step 2 Number Sentence

Based on the answers to Professor Q's four questions, students are asked to write a number sentence which reflects an appropriate relationship to the problem.

#### Step 3 Making the Sentence True

The student is asked to make the number sentence true, either through mental calculation or paper-and-pencil computation. It is not essential that students write two number sentences as might be concluded from Steps 2 and 3 on the pupil's page (page 4). The steps are separated merely to show the process that takes place.

#### Step 4 Final Statement

Students are asked to write a statement which answers the question posed in the word problem. Included are the correct numerical solution and the appropriate unit(s).

A typical format, with the computational space included, is as follows.

#### Problem

Library books.

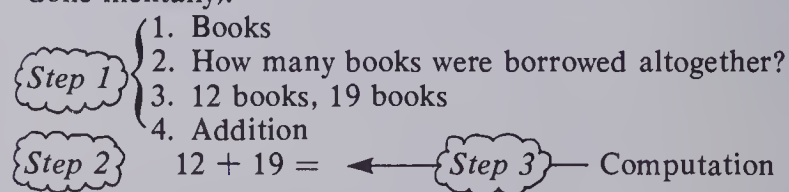
12 books about horses were borrowed by the Grade 4 class.

19 books about dogs were borrowed by the Grade 5 class.

How many books were borrowed altogether?

#### Solution

Answers to Professor Q's four questions (generally done mentally).



$$\begin{array}{r} 12 \\ +19 \\ \hline 31 \end{array}$$

Step 4: There were 31 books borrowed altogether.

## MATERIALS

grid paper

Bristol board for spinners (or pie plates)

fasteners

plastic or wooden stir sticks

tenth's and hundredth's grids on transparencies

tenth's and hundredth's grids for distribution

ten's and one's rods or number strips

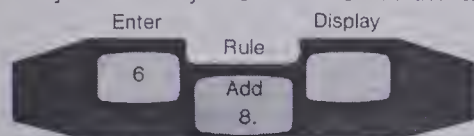
abacus

(Continued on page 4)



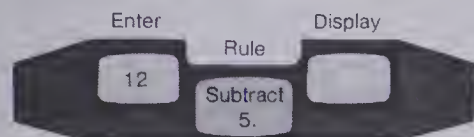
# The Quiz Machine

Sandy and Murray know how to use the Quiz Machine.



Think:  $6 + 8 =$

Write:  $6 + 8 =$

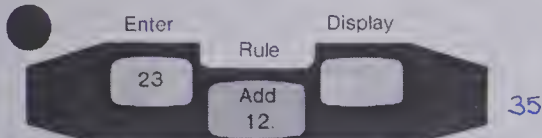


Think:  $12 - 5 =$

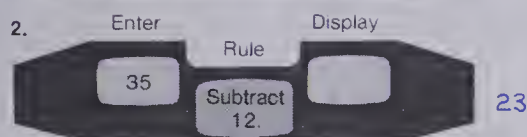
Write:  $12 - 5 =$

## Exercises

Complete these Quiz Machines.



35

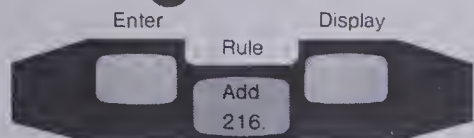


23

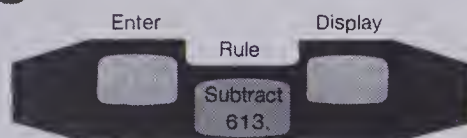
Enter each of the numbers in these Quiz Machines. Write a number sentence for each.

4. (a) 736 (b) 413 (c) 548 (d) 719

5. (a) 826 (b) 914 (c) 802 (d) 700



$736 + 216 = 952$



3. (a) Copy and complete.

Enter	Rule	Display
54	Add 26	<input type="text" value="80"/>
80	Subtract 26	<input type="text" value="54"/>
62	Add 31	<input type="text" value="93"/>
93	Subtract 31	<input type="text" value="62"/>
80	Add 19	<input type="text" value="99"/>
99	Subtract 19	<input type="text" value="80"/>

(b) What relationship do you notice in the above table?

## OBJECTIVE

To review number sentences with emphasis on missing sums and differences

## PACING

Level A All

Level B All

Level C All

## VOCABULARY

enter, rule, display, add, subtract, number sentence

## RELATED AIDS

BFA PROB. SOLVING LAB II — 1.

## SUGGESTIONS

**Initial Activity** Most students should be familiar with function tables. However, you may want to review their use as an introduction to the page. Use chalkboard examples similar to these.

Rule: Add 6.	
Enter	Display
7	13
12	<input type="text"/>
21	<input type="text"/>
37	<input type="text"/>
14	<input type="text"/>
19	<input type="text"/>

Rule: Subtract 9.	
Enter	Display
15	6
27	<input type="text"/>
31	<input type="text"/>
49	<input type="text"/>
17	<input type="text"/>
28	<input type="text"/>

Number sentences 1

## ANSWERS:

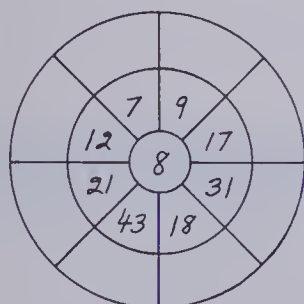
4. (a)  $736 + 216 = 952$  (b)  $413 + 216 = 629$  (c)  $548 + 216 = 764$  (d)  $719 + 216 = 935$   
5. (a)  $826 - 613 = 213$  (b)  $914 - 613 = 301$  (c)  $802 - 613 = 189$  (d)  $700 - 613 = 87$

## ACTIVITIES

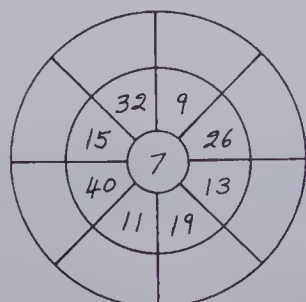
1. Encourage students to create their own function tables for addition and subtraction. Tables could be exchanged with classmates.

2. Provide drill wheels for practice in addition and subtraction.

Add



Subtract



3. Provide, or have students construct, simple addition and subtraction drill matrices for extra practice.

Add

+	4	9	7	13	24	18	35
7							
15	---	---	22				
4							
28	---	---	---	---	---	46	
17							
11							
10							

Subtract

-	21	35	18	47	32	29	50
8							
4	---	---	31				
9	---	---	---	38			
7							
11							
10							
5							

Have students describe each solution in number sentence form.

*Examples*

$7 + 6 = 13$        $12 + 6 = 18$

## USING THE BOOK

Relate the function tables demonstrated in the Initial Activity to the Quiz Machines illustrated in the display in the student's text. (In both cases, a missing sum or difference can be calculated by using the indicated operation or rule.)

Once students understand how the Quiz Machines work, assign the exercises for independent work.

In Exercises 4 and 5, be sure students understand that the listed numbers are entered one at a time.

## OBJECTIVE

To reinforce the idea of number sentences using function tables

## PACING

Level A 1-5  
Level B 2-6  
Level C 2-4, 7, 8

## RELATED AIDS

HMS — DM1.  
BFA COMP LAB II — 1-3, 16-18.  
BFA PROB. SOLVING LAB II — 2.

## SUGGESTIONS

**Initial Activity** If necessary, review the operation of function tables for addition and subtraction. Place examples on the chalkboard similar to those on the pupil's page. Include examples in which the second addend or subtrahend is missing (i.e., the rule is missing).

*Examples*

What's my rule?

Rule: ?	
Enter	Display
15	9
21	15
34	28
16	10

Rule: ?	
Enter	Display
7	18
24	35
13	24
5	16

Rule:  
[Subtract 6.]

Rule:  
[Add 11.]

## USING THE BOOK

Note that the function tables relate directly to the work done on page 1. Students are asked to write a number sentence based on the information contained in the table.

In Exercises 1 through 5, the rule is provided in order that students may calculate a missing sum or difference. In Exercises 6 and 7, students are asked to find the missing rule through investigation of the patterns. In Exercise 8, both the rule and some "Enter" numbers are missing.

## ACTIVITIES

1. Have students construct their own function tables similar to those on the page. They might wish to exchange them with classmates.

2. Provide a challenge for students by placing a "Puzzle Table for the Day" on the chalkboard. Use the format as illustrated in Exercise 8.

*Example*

What's my rule? Copy and complete.

### Follow My Rule

Follow the rules. Write a number sentence for each.

1. Rule: Add 7

Enter	Display
14	
8	
12	
34	
19	

$8 + 7 = 15$   
 $12 + 7 = 19$   
 $34 + 7 = 41$   
 $19 + 7 = 26$

2. Rule: Subtract 9

Enter	Display
26	
43	
19	
58	
31	

$43 - 9 = 34$   
 $19 - 9 = 10$   
 $58 - 9 = 49$   
 $31 - 9 = 22$

Write a number sentence for each.

3. Rule: Add 84

Enter	Display
37	
22	
16	
12	

$37 + 84 = 121$   
 $22 + 84 = 106$   
 $16 + 84 = 100$   
 $12 + 84 = 96$

4. Rule: Subtract 36

Enter	Display
39	
58	
225	
116	

$39 - 36 = 3$   
 $58 - 36 = 22$   
 $225 - 36 = 189$   
 $116 - 36 = 80$

5. Rule: Subtract 49

Enter	Display
129	
98	
210	
400	

$129 - 49 = 80$   
 $98 - 49 = 49$   
 $210 - 49 = 161$   
 $400 - 49 = 351$

What is my rule? Copy and complete each table.

6. Rule: ?

Enter	Display
18	13
24	19
16	11
31	
13	
35	

$26$   
 $8$   
 $30$

My rule is  $\square$ , subtract 5

7. Rule: ?

Enter	Display
12	27
3	18
9	24
32	
17	
21	

$47$   
 $32$   
 $36$

My rule is  $\square$ , add 15

8. Rule: ?

Enter	Display
7	16
18	27
3	
$\square$ 16	25
10	
$\square$ 29	38

$12$   
 $19$

My rule is  $\square$ , add 9

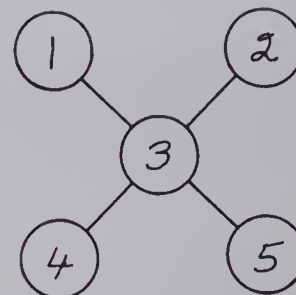
2 Number sentences

[32]  
[51]

Rule: ?	
Enter	Display
27	46
11	30
18	
	51
	70

[Rule: Add 19.]

[37]



3. Challenge students with this number puzzle. Using each of the numbers 1, 2, 3, 4, and 5 once only, place them in a position so that each line totals nine.

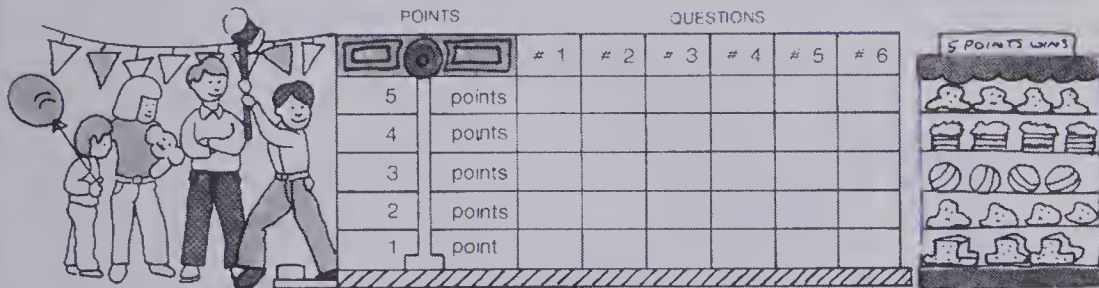
Note: Use cardboard circles or discs with a number written on each disc. This permits students to manipulate the numbers and errors do not have to be erased.



## Tune Up

1. (a)  $\begin{array}{r} 37 \\ + 29 \\ \hline 66 \end{array}$  (b)  $46 + 35 = 81$  (c)  $\begin{array}{r} 85 \\ + 29 \\ \hline 114 \end{array}$  (d)  $67 + 58 = 125$  (e)  $\begin{array}{r} 49 \\ + 34 \\ \hline 83 \end{array}$
2. (a)  $\begin{array}{r} 87 \\ - 20 \\ \hline 67 \end{array}$  (b)  $52 - 38 = 14$  (c)  $\begin{array}{r} 81 \\ - 50 \\ \hline 31 \end{array}$  (d)  $43 - 15 = 28$  (e)  $\begin{array}{r} 67 \\ - 24 \\ \hline 43 \end{array}$
3. (a)  $\begin{array}{r} 476 \\ + 909 \\ \hline 1385 \end{array}$  (b)  $324 + 406 = 730$  (c)  $\begin{array}{r} 218 \\ + 547 \\ \hline 765 \end{array}$  (d)  $296 + 318 = 614$  (e)  $\begin{array}{r} 758 \\ + 825 \\ \hline 1583 \end{array}$
4. (a)  $\begin{array}{r} 723 \\ - 408 \\ \hline 315 \end{array}$  (b)  $614 - 238 = 376$  (c)  $\begin{array}{r} 407 \\ - 151 \\ \hline 256 \end{array}$  (d)  $936 - 488 = 448$  (e)  $\begin{array}{r} 512 \\ - 116 \\ \hline 396 \end{array}$
5. (a)  $\begin{array}{r} 2563 \\ + 1920 \\ \hline 4483 \end{array}$  (b)  $3296 + 1930 = 5226$  (c)  $\begin{array}{r} 6105 \\ + 4819 \\ \hline 10924 \end{array}$  (d)  $5583 + 4214 = 9797$  (e)  $\begin{array}{r} 6295 \\ + 4099 \\ \hline 10394 \end{array}$
6. (a)  $\begin{array}{r} 6425 \\ - 3519 \\ \hline 2906 \end{array}$  (b)  $5705 - 2942 = 2763$  (c)  $\begin{array}{r} 8762 \\ - 4093 \\ \hline 4669 \end{array}$  (d)  $4930 - 1764 = 3166$  (e)  $\begin{array}{r} 8732 \\ - 1808 \\ \hline 6924 \end{array}$

Each correct answer is worth 1 point. Graph your results.



Drill addition, subtraction 3

## OBJECTIVE

To review addition and subtraction of whole numbers up to 4 digits

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

grid paper (optional)

## RELATED AIDS

BFA COMP LAB II — 4-6, 19-21.  
BFA PROB. SOLVING LAB II — 3, 4.

## USING THE BOOK

This page is designed to review and maintain skills in addition and subtraction. You may wish to assign the page as part of an on-going drill program, or you may wish to use it as an informal testing device. Whichever the case, it is recommended that the page be assigned over a number of sittings or periods, particularly for less-able students.

Computation has two aspects: accuracy and speed. While no time limit is indicated or recommended here, you may wish to have each individual student record his or her time for each set of questions.

If you use this page as an informal testing device, the following chart may be helpful in diagnosing weaknesses and preparing remedial work for those students who require it.

Exercise	Skill
1	Addition, 2 digit, regrouping
2	Subtraction, 2 digit; (a), (c), (e) no regrouping; (b), (d) with regrouping
3	Addition, 3 digit, partial regrouping
4	Subtraction, 3 digit, partial regrouping
5	Addition, 4 digit, partial regrouping
6	Subtraction, 4 digit, partial regrouping

You may wish to provide grid paper so that the pupils can copy and graph their results.

Note these two rules for constructing subtraction boxes. Each number in the top two boxes must be greater than its counterpart in the lower two boxes. Each number in the left boxes must be greater than its counterpart in the right boxes.


## ACTIVITIES

1. This would be an appropriate place to develop an on-going drill program, both written and oral. All pupils would benefit from periodic drill and some will require a more intensive program. Four or five minutes of oral drill at the beginning or end of a period will help to sharpen computational skills. Flash cards, brief chalkboard exercises, drill tapes, and math games are just some of the devices that can be used. (See the Activity Reservoir at the front of this text for some suggestions.)

Frequent drill situations that are brief, but lively, are perhaps more effective than infrequent, lengthy sessions.

2. Students might enjoy playing "Equation Ten". Place the number 10 in the centre of a piece of paper. Using addition and/or subtraction, players try to create as many equations for ten as they can.

Example

$5 + 5 = 10$   
 $18 - 8 = 10$   
  
 $1 + 2 + 3 + 4 = 10$

3. Provide, or have students create, addition and subtraction boxes.

(a) Addition Box

8	5	[13]
9	14	[23]
[17]	[19]	?
[36]		

- Add across.
- Add down.
- Find the total of the two horizontal sums.
- Find the total of the two vertical sums.
- What do you notice about the two totals?

[They are the same!]

(b) Subtraction Box

18	7	[11]
5	2	[3]
[13]	[5]	?
[8]		



OBJECTIVES

To develop a format for problem solving  
To solve simple word problems by writing  
number sentences

PACING

- Level A All
- Level B All
- Level C All

VOCABULARY

musicians, filmstrip

RELATED AIDS

BFA PROB. SOLVING LAB II — 3, 4.

BACKGROUND

If you have not already done so, see the  
Background notes in the Chapter  
Overview.

SUGGESTIONS

**Initial Activity** You may want to  
develop with students a “profile” of  
Professor Q in order to provide  
motivation for problem solving. Ask  
questions such as:

1. How old is Professor Q?
2. Does he have any degrees? What are  
they?
3. Is he married? If so, what’s his  
wife’s name?
4. Where does he live?
5. Does he wear that costume all the  
time?
6. Does he fly?
7. What does he wear when he sends  
his costume to the cleaners?

USING THE BOOK


Carefully guide students through the  
problem-solving process illustrated on  
page 4 and in Exercise 1 on page 5.  
Repeat the process with two or three  
similar problems presented on the  
chalkboard. Assign the exercises on  
page 5 for independent work.

You may wish to read through the  
problems together to be certain that  
readability does not complicate the  
exercises.


Solving Problems

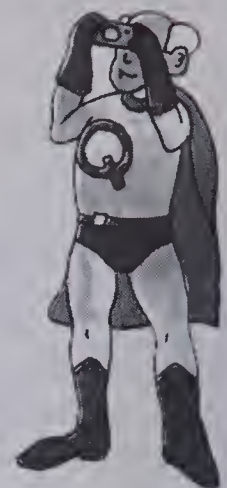
Brenda and Mary Ann collect pictures of horses.

Brenda has  
21 pictures.







Mary Ann has  
13 pictures.





How many more pictures does Brenda have than Mary Ann?

Step 1 Find answers to Professor Q’s four questions.

Questions		Answers
	1. What is the main idea?	→ Pictures
	2. What is being asked?	→ How many more pictures does Brenda have than Mary Ann?
	3. What are the important facts?	→ Brenda — 21 pictures, Mary Ann — 13 pictures
	4. What operation(s) should be used?	→ Subtraction

Step 2 Write a number sentence to fit the problem.  
21 - 13 = ■

Step 3 Make the sentence true.  
21 - 13 = 8

Step 4 Write a statement.  
Brenda has 8 more pictures than Mary Ann.

4 Problems: addition, subtraction

(Continued from Chapter Overview)

CAREER AWARENESS

Pharmacist [26]

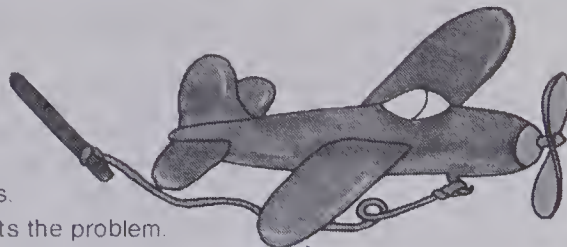
A pharmacist is largely responsible for filling  
prescriptions ordered by doctors for their patients. The  
pharmacist must decode the order from the doctor,  
carefully noting both the quantity of medicine required  
and the precise dosage. A prescription label on the  
bottle also contains the patient’s name, the date of the  
prescription, and often, how many times the  
prescription may be refilled.

A pharmacist must be aware of the new drugs  
that are developed by drug companies and must make  
sure that enough medicine is stocked to fill the  
customers’ needs.

Some commercial medicines can be sold without a  
doctor’s prescription, and a pharmacist will often help  
a customer select the appropriate cough medicine,  
suntan lotion, or headache remedy.

## Exercises

- Bruce collects toy airplanes.  
He had 17 airplanes.  
He bought 5 more.  
How many does he have now?  
(a) Answer Professor Q's four questions.  
(b) Choose the number sentence that fits the problem.  
(i)  $17 - 5 = \blacksquare$  (ii)  $\blacksquare + 5 = 17$  (iii)  $17 + 5 = \blacksquare$  (iii)  
(c) Make the sentence true.  $17 + 5 = 22$   
(d) Write a statement. **Bruce has 22 airplanes now.**



For each of the following:

- Answer Professor Q's four questions *mentally*.
- Write a number sentence to fit the problem.
- Make the sentence true.
- Write a statement.

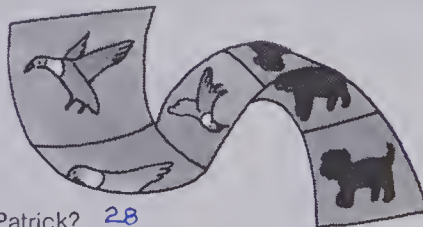
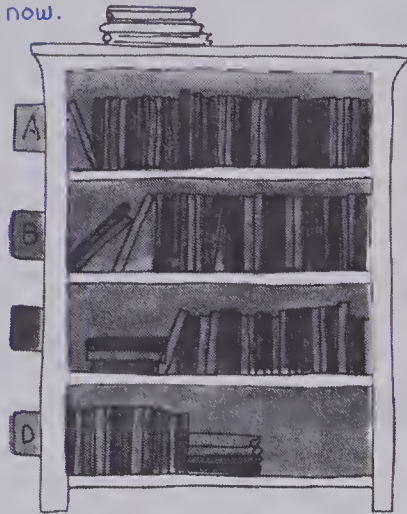
- The school library has 37 books on the "A" shelf.  
There are 26 books on the "B" shelf.  
How many books altogether? **63**

- The Crestwick City Marching Band has 230 musicians.  
The Hartford Town Band has 168 musicians.  
How many musicians altogether? **398**

- The largest alphabet in the world has 74 letters.  
The English alphabet has 26 letters.  
How many more letters does the largest alphabet have than the English alphabet? **48**

- A filmstrip on "Birds" has 38 frames.  
A filmstrip on "Dogs" has 27 frames.  
How many frames altogether? **65**

- Kathleen has 81 coins in her coin collection.  
Patrick has 53 coins.  
How many more coins does Kathleen have than Patrick? **28**



Problems: addition, subtraction 5

## ACTIVITIES

1. Often, answering the question, "What operation should be used?" is the most difficult step in the problem-solving process. Provide practice in this area by preparing a "Choose the Correct Operation" activity. Assemble a set of (10 or 15) 1-step word problems on cards (old math texts are an ideal source) and some containers (envelopes, boxes, etc.) labelled with the appropriate operation sign ("+", "-", etc.). Students are to read each problem card, decide which operation is best, and then place that card in its correct container. Containers are then given to a classmate for checking and reshuffling.

2. You might want to start collecting materials for future problem-solving activities. Data for problems abound in sources such as *Guinness Book of World Records*, *World Almanac*, *Book of Facts*, newspapers, magazines, catalogues, restaurant menus, and so on.

Most students can, with some initial guidance, create their own word problems. An appropriate selection of these can be used with the whole class.  
*Example*

Create a word problem using the given number phrase. Use the theme provided, or create your own theme.

36 - 28 (frog jumping contest)  
"Danny's frog jumped 36 cm and Sam's jumped 28 cm.  
How many centimetres farther did Danny's frog jump?"

3. Select a particularly creative word problem and offer it as the "Problem of the Day". Include a "Problem of the Week" from the selection provided at the beginning of this book.



## OBJECTIVE

To provide addition practice with several 3-digit addends

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

flight pattern, kilometre(s), km, search and rescue

## RELATED AIDS

BFA COMP LAB II — 7-9.  
BFA PROB. SOLVING LAB II — 5-8, 17, 21.

## SUGGESTIONS

**Initial Activity** As an introduction to the lesson, you might want to discuss the meaning of "search and rescue". Some students who have read about rescue attempts may wish to share their stories with the class.

To review column addition, use simple "flight patterns" either orally or on the chalkboard.

*Example*

Find the sums for these "flight patterns".

(a)	7	(b)	7	(c)	2
	4		9		6
	+8		+5		+4

## USING THE BOOK

Use the display in the student's book to review the steps in multi-digit, column addition. Emphasize the process of regrouping. Discuss with students the use of "helper numbers" (those numbers written in to show that regrouping has taken place). For instance, the "2" in step (a) represents 2 tens as a result of calculating the sum of  $8 + 8 + 5$  which is 21. The "2" is, therefore, placed at the top of the ten's column. These helper numbers occur in the displays of some of the following pages in order to reinforce the idea of regrouping.

Some students will be able to deal with regrouping mentally, and they should be encouraged to do so. Other students will probably need to write in the helper numbers until they gain more confidence in their ability to regroup mentally.

Be sure students understand that the three numbers contained in each of Exercises 1, 2, and 3 are to be written in column form and then added. You may want to supervise this carefully as

### Search and Rescue

John is searching for a missing airplane. He made this flight pattern

338 km north  
148 km east  
275 km north

How many kilometres altogether?

(a) Add ones.

$$\begin{array}{r} 338 \\ 148 \\ + 275 \\ \hline \end{array}$$

(b) Add tens.

$$\begin{array}{r} 338 \\ 148 \\ + 275 \\ \hline 61 \end{array}$$

(c) Add hundreds.

$$\begin{array}{r} 338 \\ 148 \\ + 275 \\ \hline 61 \end{array}$$

He flew 761 km altogether.

---

**Exercises**

Find how many kilometres in these flight patterns.

1.

2.

3.

Add these flight patterns.

4.

$$\begin{array}{r} 327 \\ 232 \\ + 384 \\ \hline 943 \end{array}$$

5.

$$\begin{array}{r} 217 \\ 502 \\ + 175 \\ \hline 894 \end{array}$$

6.

$$\begin{array}{r} 520 \\ 119 \\ + 304 \\ \hline 943 \end{array}$$

7.

$$\begin{array}{r} 416 \\ 103 \\ + 231 \\ \hline 750 \end{array}$$

8.

$$\begin{array}{r} 283 \\ 357 \\ + 609 \\ \hline 1249 \end{array}$$

9.

$$\begin{array}{r} 610 \\ 102 \\ + 547 \\ \hline 1259 \end{array}$$

10.

$$\begin{array}{r} 318 \\ 407 \\ + 296 \\ \hline 1021 \end{array}$$

11.

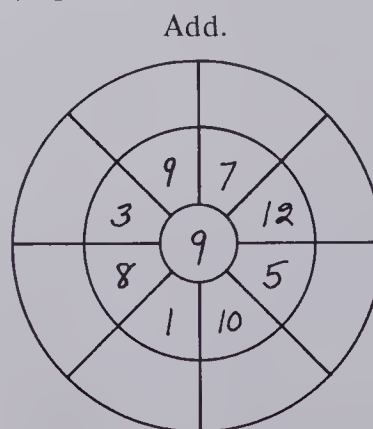
$$\begin{array}{r} 553 \\ 420 \\ + 619 \\ \hline 1592 \end{array}$$

6 Addition: 3-digit addends

independent work, or ask three student volunteers to rewrite the numbers in column form on the chalkboard first.

## ACTIVITIES

1. Provide, or have students create, addition drill wheels for practice with basic facts.



2. Provide an addition grid similar to the following. Encourage students to create their own, then exchange with classmates.

Add sets of three 1-digit numbers horizontally, vertically, and diagonally.

What do you notice about the sums in boxes opposite each other? [The sums are the same because addends can be added in any order without affecting the sum. This is the commutative property.]

		23		13
	7	9	1	
	2	8	5	
		6	3	
13		23		

Construct grids using 2-digit numbers. You might include multiples of 10; e.g., 20, 70, and so on.

3. Provide practice with oral drills. Ask a student to say his or her favourite number less than 10. Then say, "To that number add 7; add 3; add 8 (and so on). What is the sum?"





## Rescue



Lake



John received this number code.  
Break the code to find  
the missing airplane!

Add. Match the letters with the answers below  
The first one is done for you!

R	26	N	106	T	35	K	309	B	86
	37		23		20		146		19
	+ 58		+ 152		63		250		+ 24
	121		281		+ 18		+ 128		129
O	115	H	25	A	136	W	833	M	11 631
	27		89		5176		65		30 052
	+ 30		30		3810		32		25 812
	172		+ 42		+ 1162		+ 18		+ 40 418
			186		10 148		115		107 913
I	26	E	29 112	L	58	D	37	U	7078
	345		36 853		47		51		1422
	+ 63		+ 47 384		+ 119		+ 42		+ 3253
	434		113 349		224		130		11 753

W E A R E

115 113 349 10 148 121 113 349

A E T W E E N

129 113 349 136 115 113 349 113 349 281 136 186 113 349

M O U V T A I N

107 913 172 11 753 281 136 10 148 434 281

A N D L A K E

10 148 281 130 224 10 148 833 113 349

Addition practice: 2- to 5-digit addends 7

## OBJECTIVE

To provide further addition practice  
with 2- and 3-digit addends

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

number code

## RELATED AIDS

HMS — DM2.  
BFA COMP LAB II — 10, 11.  
BFA PROB. SOLVING LAB II — 5-8,  
17, 21.  
CALC. W/BK — 3.

## USING THE BOOK

At one time or another, most students  
will have worked with number codes.  
Work through the first two or three  
parts of the puzzle with those students  
who are unfamiliar with this type of  
code. You may wish to simplify things  
by preparing and distributing the last  
section of the puzzle so that the  
students will have somewhere to write  
their letters.

### Variations:

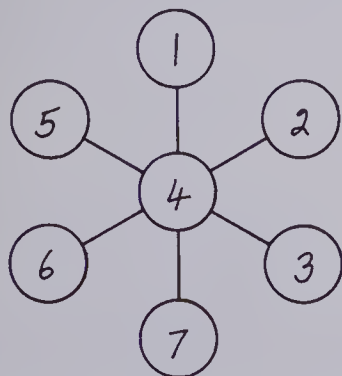
- To increase score values, add *all* "look-alikes"; e.g.,  
 $7 + 7 + 8 + 8 = 30$ .
  - If a die is not available, use a  
spinner or say, "Place the numbers  
from 1 to 9 (or 8 to 15, etc.)  
anywhere on the grid."
  - Use larger numbers. Say, "Place  
nine of your favourite numbers  
between 20 and 50 anywhere on the  
grid."
3. Challenge students with the  
"Rousing Rectangle".

	A	B	C
D	8	15	1
E	2	[9]	13
F	11	3	[10]
G	14	[6]	4
H	5	[7]	[12]

The sum of the numbers in column A is  
40. The sum of the numbers in row D  
is 24. Fill in the other blank squares so  
that columns B and C each equal 40  
and rows E to H each equal 24. Use  
numbers between 1 and 15 once only.

## ACTIVITIES

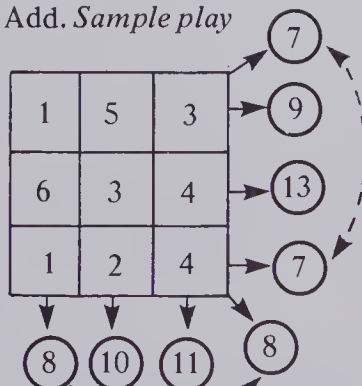
- Challenge students with this number  
puzzle. Using each of the numbers 1, 2,  
3, 4, 5, 6, and 7 once only, place them  
in a position so that each line totals  
twelve.



(As suggested in the teaching notes on  
page 2, print the numbers on cardboard  
circles or discs. In this way, students  
can manipulate the numbers as they  
seek a solution. Mistakes, then, do not  
have to be erased.)

- Play the game "Look-Alikes".  
Provide several copies of the following  
gameboard. Students can play as a  
whole class or in pairs.

### Add. Sample play



- One player rolls an ordinary die 9  
times.
- The rolled numbers are placed  
anywhere on the grid.
- Each player adds the numbers on  
his/her grid, placing the sums in the  
answer circles.
- Any "look-alikes" (pairs of identical  
sums) are used to calculate a  
player's score. (In the sample play,  
the 7 and 8 have "look-alikes";  
therefore, this player's score is  
 $7 + 8$  or 15.)
- Compare scores with other players.  
Who has the highest score? The  
winner is the player with highest  
score for that round.

OBJECTIVE

To use several addends in problem-solving situations

PACING

- Level A All
- Level B All
- Level C All

VOCABULARY

freeble (a nonsense word), mentally

RELATED AIDS

BFA PROB. SOLVING LAB II — 9, 11-13.

SUGGESTIONS

**Initial Activity** You might wish to review briefly the format you have established for problem solving. Encourage students not to omit the four questions of Professor Q. (See the teaching notes for page 4.) Most students should be able to handle this organizational technique mentally.

USING THE BOOK

Read through the display in the student's book together. If necessary, emphasize where each number in the calculation on the right side of the page came from. Assign the exercises. Be certain that the students are familiar with the accepted classroom answer format (i.e., are answers in workbooks or on sheets? dated? numbered? calculations shown? final written statements? etc.).

ACTIVITIES

1. Students might enjoy the opportunity to illustrate what they think a "freeble" might look like. Encourage pupils to describe how a "freeble" works.
2. Some students may wish to create their own nonsense words and develop word problems based on them. Problems could be collected and used at a later time for extra practice.
3. Play the game "Look-Alikes" as described on page 7 of the teaching notes. Use 2-digit numbers.

The Freeble Factory

Tiffany made



35 freebles.

Ivan made



28 freebles.

Doug made



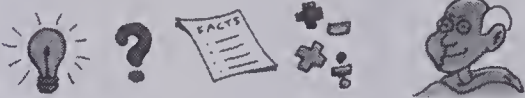
41 freebles.

How many freebles were made altogether?

35  
28  
+ 41  
-----  
104

Exercises

Solve these problems. Remember to answer Professor Q's four questions *mentally*.



1. There are 45 duffydoodles in the shop, 39 in the truck, and 50 on the loading dock. How many duffydoodles are there altogether? **134**
2. Carol packed 425 whatzits, Kathleen packed 398, and Sam packed 402. How many whatzits were packed altogether? **1225**

3.

Tribles	
Monday	56
Tuesday	42
Wednesday	39
Thursday	60
Friday	47

This chart shows how many tribles were made each day. How many tribles were made altogether? **244**



4. The factory has received these orders for zorms. How many zorms will they have to make altogether? **672**

Please send  
225 zorms.

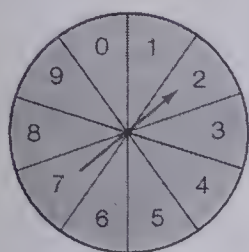
Please send  
360 zorms.

Please send  
87 zorms



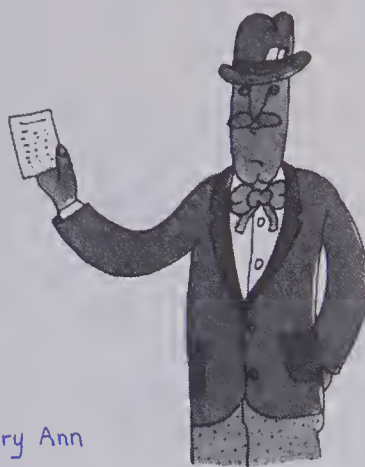
# Spin to Win

Make a spinner.



## Rules

1. Spin twice.
2. Make a 2-digit number.
3. Add the number to your score.  
(Score starts at 200.)
4. If one of the digits is a 4, subtract from your score.
5. Highest score after ten spins is the winner.



Copy and complete these two scorecards first. Who won? *Mary Ann*

	Operation	Score
		200
1	+ 53	253
2	+ 82	335
3	- 34	301
4	+ 75	376
5	- 49	327
6		387
7	+ 91	478
8	+ 66	544
9	- 14	530
10	+ 32	562

	Operation	Score
		200
1	- 24	176
2		245
3	+ 50	295
4	+ 61	356
5	- 47	309
6		361
7	+ 73	434
8	- 04	430
9	+ 82	512
10	+ 53	565

Make some scorecards. Play the game with a classmate. Check each other's scorecards.

Activity addition, subtraction. 9

## OBJECTIVE

To provide extra practice with column addition (activity)

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

spinner shown on pupil page

## RELATED AIDS

BFA PROB. SOLVING LAB II — 10, 14-16, 18, 19.

## BACKGROUND

Consider using this game initially with all students. The game could then be put away and brought out later for use with those students who require further drill.

While not stated in the rules, there is a strategy (based on place value) to make the most of a player's gains and to minimize losses. For example, if a 3 and a 7 are spun, a player is wise to consider the number 73 (rather than 37) as an addend to his or her score. If a player spins a 4 and a 2, the player should select 24 (rather than 42) as a subtrahend.

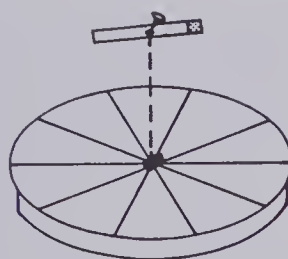
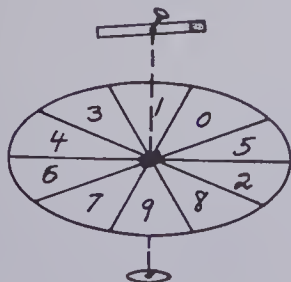
## USING THE BOOK

Review the rules of the game carefully with the class. Note that in Rule 5, "ten spins" means "ten sets of two spins" because players are generating ten 2-digit numbers.

You may want to complete the score cards by using the chalkboard with the whole class helping in the completion. The students then could play their own games in pairs.

## SUGGESTIONS

**Initial Activity** You may want to have students construct their own spinners from a cardboard circle (or pie plate), thumbtack, and plastic or wooden stir stick. Use a magic marker to mark the arrow on the stir stick.



Provide students with dittoed score cards or have pupils construct their own. Alternately, you may wish to allow students to keep a running total in a single column on a scrap piece of paper.

Round	Score
	200
1	+ 53
	253
2	+ 82
	335
3	- 34
	301

These spinners can be used effectively on an on-going basis for drill sessions with all four operations.

You may wish to construct your own spinner for use on the overhead projector by using the clear plastic lid from a coffee can. Mark off the segments and write in the numbers using a black magic marker. Use a thumbtack and stir stick for the spinner.



## OBJECTIVES

- To develop the relationship between the fractional and decimal forms of tenths and hundredths
- To develop a place-value awareness of decimals to the hundredth's place

## PACING

- Level A All
- Level B All
- Level C All

## VOCABULARY

decimal, grid

## MATERIALS

overhead projector, multiple copies of tenth's and hundredth's grids on overhead transparencies, pupil copies of grids

## RELATED AIDS

BFA COMP LAB II—82, 83.

## SUGGESTIONS

**Initial Activity** Using the overhead projector and a transparency of the tenth's grid, review the fractional concept of tenths. For example, ask, "Into how many parts is the grid divided? [ten]" "What is each part named? [one tenth]" Shade in three parts and ask, "How many tenths are shaded? [three tenths]"

Write 0.3 on the chalkboard and say, "Three tenths can be written like this. It is read as *zero decimal three*." Repeat if you think necessary and then instruct students to shade in portions of their own grids. For example, say, "Shade in portions that would represent four tenths. [position of portions shaded will vary]" "What is the decimal name for four tenths? [0.4]" Then say, "Shade in portions that would represent zero decimal 6. What is the fractional name for this? [ $\frac{6}{10}$ ]"

Repeat this process using the hundredth's grids.

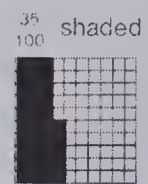
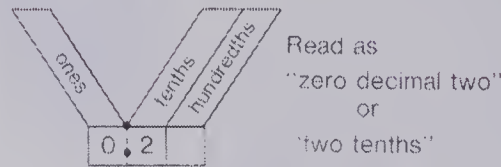
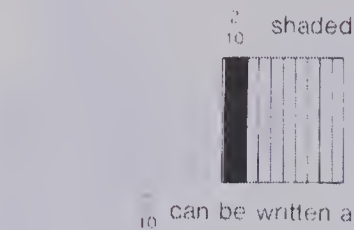
## USING THE BOOK

Use the display in the student's book to consolidate the initial activity. You might point out to students that, in a decimal like 0.2 or 0.35, the zero indicates "no ones". It also signals that there is a decimal point present which otherwise might be missed or ignored.

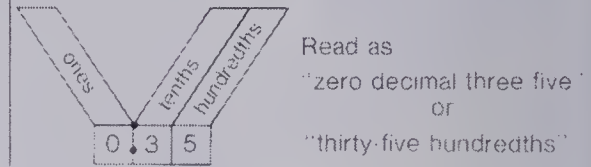
## ACTIVITIES

1. You might challenge some students to explore other decimal relationships by providing questions like these.

## Decimal Grids

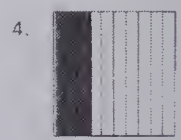
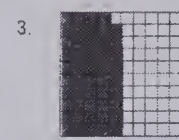
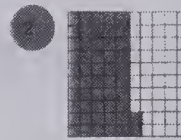
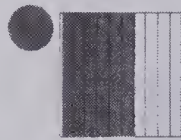


$\frac{35}{100}$  can be written as 0.35.

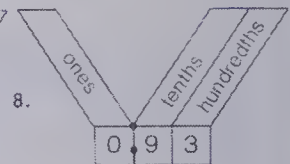
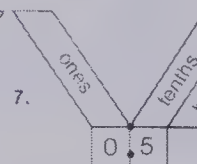
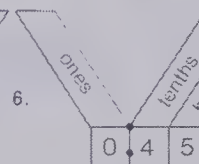
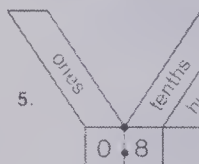


### Exercises

Write a decimal to match the shading in each grid.



Read these decimals.



Write each as a decimal.

9. zero decimal nine one 0.91

10. zero decimal seven 0.7

11. zero decimal three 0.3

12. zero decimal five 0.5

13.  $\frac{4}{10}$  0.4

14.  $\frac{26}{100}$  0.26

15.  $\frac{9}{10}$  0.9

★ 16.  $\frac{5}{100}$  0.05

★ 17.  $\frac{50}{100}$  0.50

10 Place value decimals — tenths, hundredths

### ANSWERS:

5. "zero decimal eight" or "eight tenths"

6. "zero decimal four five" or "forty-five hundredths"

7. "zero decimal five" or "five tenths"

8. "zero decimal nine three" or "ninety-three hundredths"

### Example

Which is greater?

(a) 0.20 or 0.2

(b) 0.05 or 0.5

How would you read the decimal 0.09?

How would you demonstrate that

$$\frac{3}{10} = \frac{30}{100} ?$$

2. Play "Concentration" as described in the Activity Reservoir. Use cards such as the following.



3. Using the spinners constructed for page 9, provide extra practice in writing fractions and their equivalent

decimals. Spin the spinner to find the numerator. Express in both fraction and decimal form. For example, if 7 shows on the spinner, ask the students to write both  $\frac{7}{10}$  and 0.7. To practise with hundredths, spin it twice to generate a 2-digit number. If 35 is spun, pupils are to write  $\frac{35}{100}$  and 0.35.

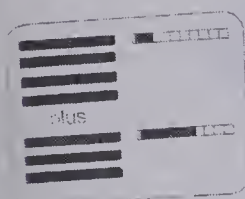
## EXTRA PRACTICE

Write each as a decimal.

- zero decimal nine one
- $\frac{19}{100}$
- $\frac{7}{10}$
- $\frac{70}{100}$
- $\frac{33}{100}$
- zero decimal two two
- zero decimal zero one
- $\frac{65}{100}$
- forty-eight hundredths
- nine tenths

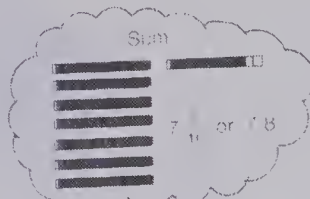
Irene has 3 cards that give the same sum

## 3 of a Kind

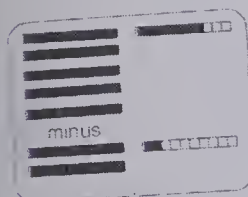


$$\begin{array}{r} 4 \frac{2}{10} \\ + 3 \frac{6}{10} \\ \hline 7 \frac{8}{10} \end{array}$$

$$\begin{array}{r} 12 \\ + 36 \\ \hline 78 \end{array}$$

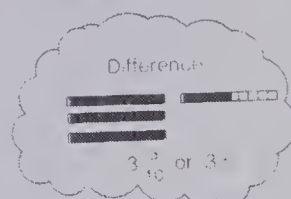


Terry has 3 cards that give the same difference



$$\begin{array}{r} 5 \frac{2}{10} \\ - 2 \frac{4}{10} \\ \hline 3 \frac{2}{10} \end{array}$$

$$\begin{array}{r} 57 \\ - 22 \\ \hline 35 \end{array}$$



### Exercises

#### Add

1. $\begin{array}{r} 4.3 \\ + 2.4 \\ \hline 6.7 \end{array}$	2. $\begin{array}{r} 3.5 \\ + 4.1 \\ \hline 7.6 \end{array}$	3. $\begin{array}{r} 5.6 \\ + 3.3 \\ \hline 8.9 \end{array}$	4. $\begin{array}{r} 2.6 \\ + 2.1 \\ \hline 4.7 \end{array}$	5. $\begin{array}{r} 4.5 \\ + 2.3 \\ \hline 6.8 \end{array}$
--	--	--	--	--

#### Subtract

6. $\begin{array}{r} 7.5 \\ - 2.4 \\ \hline 5.1 \end{array}$	7. $\begin{array}{r} 8.6 \\ - 4.5 \\ \hline 4.1 \end{array}$	8. $\begin{array}{r} 5.5 \\ - 3.4 \\ \hline 2.1 \end{array}$	9. $\begin{array}{r} 6.8 \\ - 5.2 \\ \hline 1.6 \end{array}$	10. $\begin{array}{r} 7.9 \\ - 2.5 \\ \hline 5.4 \end{array}$
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#### Perform these operations

11. $\begin{array}{r} 6.3 \\ + 2.8 \\ \hline 9.1 \end{array}$	12. $\begin{array}{r} 7.2 \\ - 1.8 \\ \hline 5.4 \end{array}$	13. $\begin{array}{r} 5.6 \\ + 2.5 \\ \hline 8.1 \end{array}$	14. $\begin{array}{r} 6.1 \\ - 3.4 \\ \hline 2.7 \end{array}$	15. $\begin{array}{r} 8.3 \\ - 5.5 \\ \hline 2.8 \end{array}$
16. $\begin{array}{r} 6.8 \\ + 7.5 \\ \hline 14.3 \end{array}$	17. $\begin{array}{r} 5.0 \\ - 2.6 \\ \hline 2.4 \end{array}$	18. $\begin{array}{r} 8.0 \\ + 8.9 \\ \hline 16.9 \end{array}$	19. $\begin{array}{r} 7.0 \\ - 5.6 \\ \hline 1.4 \end{array}$	20. $\begin{array}{r} 9.3 \\ - 2.5 \\ \hline 6.8 \end{array}$

Addition, subtraction of decimals (tenths) including zeros 11

## OBJECTIVE

To add and subtract decimals to the tenth's place

## PACING

Level A All

Level B All

Level C All

## MATERIALS

ten's and one's rods or number strips

## VOCABULARY

sum, difference

## RELATED AIDS

CALC. W/BK — 22.

## SUGGESTIONS

**Initial Activity** The display in the student's book attempts to show the relationship between fractional and decimal numbers based on a concrete model. Depending on the background of your students, you may want to provide concrete experiences for the class before moving to the paper-and-pencil addition and subtraction. Provide each student with number blocks or strips and then have them build addition and subtraction models as shown in the display. You (or a student recorder) could record the matching fraction and decimal written on the chalkboard. Note that the concrete model reinforces the vertical-column orientation of the actual algorithm.

## USING THE BOOK

Read through the display at the top of the pupil page together. Clarify for the students that the three cards in each instance indicate equal values. You may wish to (a) demonstrate both the addition and subtraction operations using coloured strips as shown on the pupil page, and (b) repeat using other examples.

The answers for Exercises 1, 6, 11, and 12 are at the back of the pupil's text. You may wish to complete these four exercises together and then check for accuracy. Assign the exercises.

Note that Exercises 1 to 10 involve no regrouping, while Exercises 11 to 20 involve regrouping.

(For a simplified version of Activities 1 and 2, see "The P.V. Game" as described in the Activity Reservoir.)

## ACTIVITIES

1. Use the overhead spinner as described on page 9 of the teaching notes to play "Greatest Sum".

(a) Pupils could draw the appropriate spaces for this game on a scrap piece of paper.

$$\begin{array}{r} \square \cdot \square \\ + \square \cdot \square \\ \hline \end{array} \quad \text{or} \quad \begin{array}{r} \square \cdot \square \\ + \square \cdot \square \\ \hline \end{array}$$

(b) Spin the overhead spinner. Each student places the indicated digit in any one of the four spaces, keeping in mind that the object of the game is ultimately to make the greatest possible sum. For example, if a 9 is spun, it would be a good strategy to place it in either of the one's spaces rather than the tenth's spaces.

(c) Repeat for the other three digits one at a time.

(d) Each player then adds the two numbers. Pupil(s) with the greatest sum wins.

### Sample play

(Four digits spun: 8, 5, 0, and 3.)

Player 1	Player 2
$\begin{array}{r} 3 \cdot 5 \\ + 8 \cdot 0 \\ \hline 11 \cdot 5 \end{array}$	$\begin{array}{r} 8 \cdot 0 \\ + 5 \cdot 3 \\ \hline 13 \cdot 3 \end{array}$

Player 2 has the greater sum and, therefore, is the winner.

On occasion, a player who has the greatest sum in comparison to the rest of the class may not have achieved the greatest possible sum. In this case, it is wise to clarify this point and involve the class in the decision as to what constitutes the greatest possible sum.

2. The same game, with changes in strategy, can be used to play "Least Sum", "Greatest Difference", and "Least Difference". These games can be used as part of a regular drill session or they can be effective during the first or last few minutes of a math period.



## OBJECTIVE

To add and subtract decimals to the hundredth's place

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

Rock Stars, stereo, album, cassette tapes

## RELATED AIDS

BFA COMP LAB II — 23.  
CALC. W/BK — 24.

## SUGGESTIONS

**Initial Activity** Use dimes and pennies to illustrate the idea of tenths and hundredths. For example, there are ten dimes in one dollar; therefore, one dime is equal to one tenth of a dollar. There are one hundred pennies in a dollar; therefore, one penny is equal to one hundredth of a dollar. Discuss with students the "meaning" of a sum of money.

*Example*

\$1.45

(i) one dollar plus 4 dimes plus 5 pennies

(ii) one plus 4 tenths plus 5 hundredths

(iii)  $1 + \frac{4}{10} + \frac{5}{100}$

Using the chalkboard, demonstrate that decimal points are lined up one under another for addition and subtraction because of place-value considerations.

*Example*

\$1.45 one whole, 4 tenths, 5 hundredths  
+ 1.34 one whole, 3 tenths, 4 hundredths

\$2.79 two wholes, 7 tenths, 9 hundredths

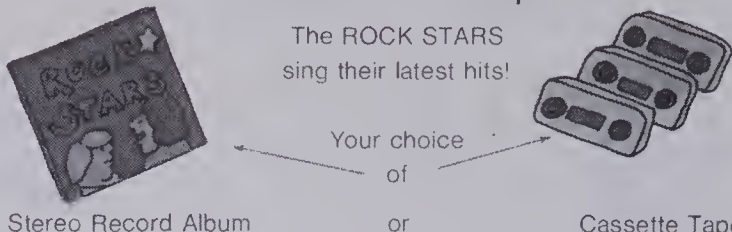
Students should understand that, apart from the visible use of the decimal point, the process of addition and subtraction of decimals is the same as addition and subtraction of whole numbers. It also involves the use of "helper numbers" as an aid in the process of regrouping.

## USING THE BOOK

Use the display in the student's book to consolidate the ideas presented in the initial activity. Draw the pupils' attention to the relationship between (a) "total" and the "+" sign beside the calculation, and (b) "difference" and the "-" sign.

Assign the exercises for independent work. In Exercises 9 to 16, caution

### Records and Tapes



Total cost of album and tapes.

$$\begin{array}{r} \$23.96 \\ + 27.85 \\ \hline \$51.81 \end{array}$$

Difference in price of album and tapes.

$$\begin{array}{r} \$27.85 \\ - 23.96 \\ \hline \$ 3.89 \end{array}$$

#### Exercises

Add.

1. $\begin{array}{r} \$35.42 \\ + 18.65 \\ \hline \$54.07 \end{array}$	2. $\begin{array}{r} \$37.04 \\ + 26.88 \\ \hline \$63.92 \end{array}$	3. $\begin{array}{r} \$1.95 \\ + 4.25 \\ \hline \$6.20 \end{array}$	4. $\begin{array}{r} \$235.49 \\ + 358.27 \\ \hline \$593.76 \end{array}$
--	--	---	---

Subtract.

5. $\begin{array}{r} \$84.29 \\ - 37.68 \\ \hline \$46.61 \end{array}$	6. $\begin{array}{r} \$67.38 \\ - 34.89 \\ \hline \$32.49 \end{array}$	7. $\begin{array}{r} \$6.95 \\ - 2.15 \\ \hline \$4.80 \end{array}$	8. $\begin{array}{r} \$515.00 \\ - 327.19 \\ \hline \$187.81 \end{array}$
--	--	---	---

Perform these operations.

9. $\begin{array}{r} 31.05 \\ - 14.78 \\ \hline 16.27 \end{array}$	10. $\begin{array}{r} 250.66 \\ + 417.85 \\ \hline 668.51 \end{array}$	11. $\begin{array}{r} 86.29 \\ + 28.55 \\ \hline 114.84 \end{array}$	12. $\begin{array}{r} 702.37 \\ + 217.01 \\ \hline 919.38 \end{array}$
13. $\begin{array}{r} 90.75 \\ + 92.23 \\ \hline 182.98 \end{array}$	14. $\begin{array}{r} 60.00 \\ - 20.74 \\ \hline 39.26 \end{array}$	15. $\begin{array}{r} 526.00 \\ + 717.39 \\ \hline 1243.39 \end{array}$	16. $\begin{array}{r} 260.25 \\ - 193.07 \\ \hline 67.18 \end{array}$

12 Addition, subtraction of decimals (hundredths) including zeros

the students to watch for the operation signs.

## ACTIVITIES

1. Newspapers and magazines provide a wealth of decimals in a problem-solving context from real life. Students could be encouraged to develop their own problems from data gathered from the media.

2. Catalogues can provide data for problem-solving situations. For example,

(a) You have \$100.00 to spend. Select any products you wish from the catalogue. Make their total value as

close to \$100.00 as possible.

(b) You want to buy new furniture for your bedroom. Select the products you wish and then find the total value. If you were to pay \$15.00 a week, how long would it take you to pay for the furniture?

(c) You have \$15.00. How many *different* items can you buy for that amount?

3. Play "Greatest Sum" as described on page 11 of the teaching notes. Increase the number of spaces used (and numbers spun) as students gain confidence.



## Decimal Dilemma

Correct this decimal dilemma!

The human eye blinks  
about 2500 times  
each minute.

Which is more reasonable?

250.0 ?	25.00 ?	2.500 ?
(250)	(25)	(2.5)
too much	most reasonable	too little



Each of the following statements  
is incorrect and unreasonable because  
the decimal point is missing.  
Correct each statement by placing  
the decimal point in the proper  
position.

The human eye blinks about 25 times each minute.

- |   |   |
|---|---|
| <p>● The Browns have a new baby girl. She has a mass of 46 kg. <b>4.6 kg</b></p> <p>3. The ceiling in the Bradford's new recreation room is 210 m from the floor. <b>2.10 m</b></p> <p>5. The Harrisons drove for ten hours in their car to visit relatives. They covered 6000 km. <b>600.0 km</b></p> <p>7. One of the highest weather temperatures recorded in the world is 5800°C. <b>58.00°C</b></p> <p>9. Brad, an excellent runner, covered the one hundred metre run in 1350 s. <b>135.0 s</b></p> <p>★ 11. Allan paid \$1.78 for his meal at Hamburger Haven. He gave the clerk a 5-dollar bill and received \$322 in change. <b>\$3.22</b></p> | <p>2. Katherine travelled twelve kilometres on her bike. The trip took her 125 h. <b>1.25 h</b></p> <p>4. Tony measured the length of his middle finger. He said it was 62 cm long. <b>6.2 cm</b></p> <p>6. Gerald bought a new bicycle. He paid \$15899 for it. <b>\$158.99</b></p> <p>8. The average can of pop contains 2840 mL of liquid. <b>284.0 mL</b></p> <p>10. The doctor said that Barbara was quite healthy. Her temperature was 370°C. <b>37.0°C</b></p> <p>★ 12. Marcie needed four ribbons each 2.3 m long. The total length of ribbon needed was 920 cm. <b>9.20 cm</b></p> |
|---|---|

Estimating to place the decimal point 13

## OBJECTIVE

To place the decimal point in the most reasonable position using the context of a word story

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

decimal dilemma, reasonable, ceiling, relatives

## SUGGESTIONS

**Initial Activity** Discuss the importance of placing the decimal point in the proper position. Consider the confusion that might be caused if newspaper ads omitted or misplaced the decimal point.

*Examples*

- (a) House for sale! \$7500000  
(b) Buy one book for \$3.00 — get the second one for only \$100!

We can often determine the proper position of the decimal from the context of the situation. Based on our experience, one selection is more reasonable than another. You might use examples similar to these to reinforce this idea.

*Examples*

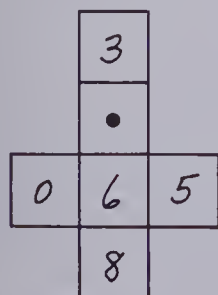
- (a) Our school library is about how many metres wide?  
1.2 m, 12 m, 120 m  
(b) Most Grade 5 students are how many years old?  
1, 10, 100  
(c) Paperback books contain about how many pages?  
2.6, 26, 260, 2600

## USING THE BOOK

You may want to preview the exercises to determine which ones (if any) may fall outside of the experience of your students. These exercises could be done as a whole class activity. The remaining exercises should be assigned as independent work.

## ACTIVITIES

1. Prepare a die as shown.



*Variations:*

- (a) "Low Roller" The player with the least number wins each round.  
(b) Have players add their five numbers when all have had a turn. The player with the highest (or lowest) total wins.

2. Some students might enjoy selecting interesting facts from the *World Almanac* or the *Guinness Book of World Records*. Facts could be printed on individual file cards with the decimal point omitted or misplaced. (The correct fact could be printed on the back of the card.) These cards could be placed at an activity centre or displayed on a bulletin board.

3. Some students may wish to investigate and make a list of some of the uses of the decimal point: e.g., library card catalogues, dollars and cents, measurement situations, scientific notation, and so on.

Use it to play "High Roller". Each player rolls the die 4 times and writes down each number (or decimal point) as rolled. (Roll 2 decimal points and your score is zero.) The player with the greatest number wins the round. The first player to win five rounds is the overall winner.

## OBJECTIVE

To develop place-value skills to the thousand's place

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

abacus, place-value chart, meaning, expanded form

## MATERIALS

overhead transparency spinner (as described on page 9 of teaching notes)

## SUGGESTIONS

**Initial Activity** Introduce students to the game "Greatest Number". Have students draw the number of spaces equivalent to the place value you wish to drill (in this case 4 spaces for thousands).

\_\_\_\_\_ or □ □ □ □

Spin the overhead spinner to obtain a digit. Students place that digit in any of the four spaces, keeping in mind that the object of the game is to construct the "Greatest Number". Repeat for the other three digits one at a time. Person(s) with the greatest number wins!

### Sample play

(Four digits spun: 2, 5, 7, and 3.)

Player 1                      Player 2

5   7   2   3                  7   2   5   3

[Player 2 has the greater number and is the winner.]

While Player 2 may have achieved the greatest number in relation to the rest of the class, he or she has not constructed the greatest *possible* number using the digits 2, 5, 7, and 3. Place value can be enhanced by asking a few directed questions.

- Who obtained the greater number? [player #2]
- How do you know? [Because the 7 which represents 7000 is greater than the 5 which represents 5000.]
- What is the greatest possible number that could be made from the digits 2, 7, 5, and 3? [7532]

This game can be effectively used with the whole class. Many students will quickly develop a strategy for the placement of the digits. For example, if the digit 8 is spun, it is reasonable to place it in the thousand's place. (The assumption here is that a 9 may have little chance of occurring on the next three spins.) If the digit 2 is spun, it

## Place Value

One of the deepest holes drilled for a gas well was

9583 m.

Read as: "nine thousand, five hundred eighty-three".

Abacus



Place-value chart

thousands	hundreds	tens	ones
9	5	8	3

Meaning: 9 thousands, 5 hundreds, 8 tens, 3 ones

Expanded form:  $9000 + 500 + 80 + 3$



### Exercises

Read these numerals.



thousands	hundreds	tens	ones
4	7	2	5

2.

thousands	hundreds	tens	ones
3	0	6	2

3.

thousands	hundreds	tens	ones
8	3	0	7

4.

thousands	hundreds	tens	ones
5	2	8	0

Write numerals for each.



3 thousands, 0 hundreds, 7 tens, 2 ones

**3072**



7. 7 thousands, 9 hundreds, 0 tens, 6 ones

**7906**



$3000 + 200 + 50 + 6$

**3256**



11.  $6000 + 400 + 0 + 7$

**6407**



six thousand, five hundred seventeen

**6517**



15. seven thousand, four

**7004**

6. 8 thousands, 4 hundreds, 5 tens, 0 ones

**8450**

8. 4 thousands, 8 hundreds, 3 tens, 1 one

**4831**

10.  $9000 + 0 + 20 + 8$

**9028**

12.  $5000 + 700 + 40 + 0$

**5740**

14. two thousand, nine hundred, sixty-one

**2961**

14 Place value thousands

should probably be placed in the ten's or one's place.

## USING THE BOOK

The games described in the Initial Activity and in Activities 1 and 2 provide an understanding of the place-value descriptions in the display in the student's book. Students should note that the display illustrates five different representations of the numeral 9583.

Exercises 1 to 4 could be done orally and Exercises 5 to 15 assigned as independent work.

## ACTIVITIES

1. Play a few more rounds of "Greatest Number".

2. Introduce students to a variation of the same game — "Least Number". The strategy and logic used for this game is the reverse of "Greatest Number".

### Sample play

(Four digits spun: 7, 3, 1, and 0.)

Player 1

Player 2

0   3   1   7

1   3   7   0

[Player 1 wins with 0317 or 317.]

### ANSWERS:

- four thousand, seven hundred twenty-five
- three thousand, sixty-two
- eight thousand, three hundred seven
- five thousand, two hundred eighty

The least possible number is 0137 or 137.

3. Provide 4 decks of cards, each deck a different colour, consisting of the numerals from 0 to 9. Inform players of the colour code, e.g., red numerals are ones, blues are tens, greens are hundreds, blacks are thousands. Each player selects 1 card from each deck and writes the expanded form of the number shown, e.g., draw **4 7 3 5** →  $4000 + 700 + 30 + 5$ . Cards are reshuffled and the next player takes a turn. Scoring can be done in a number of ways:

- Greatest (or least) number wins.
- Before drawing, a player calls out a place-value location and uses that digit as a score for that round (e.g., in the example above, "hundreds" would have scored "7").
- Don't return cards to decks but keep a running total of correctly expanded numbers. Greatest (or least) number after 3 turns is the winner.



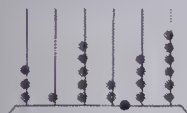
# Place Value

The greatest distance travelled in a balloon was

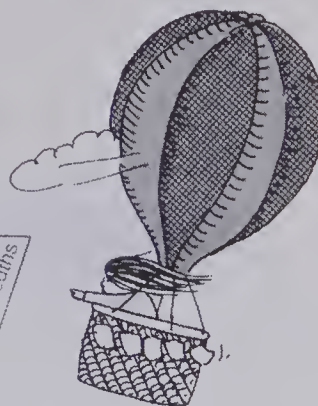
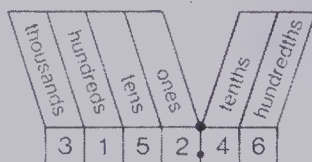
3152.46 km.

Read as: "three thousand, one hundred fifty-two decimal four six".

Abacus



Place-value chart

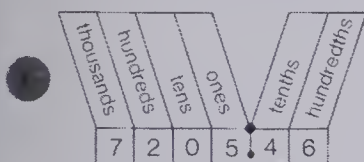


Meaning: 3 thousands, 1 hundred, 5 tens, 2 ones, 4 tenths, 6 hundredths

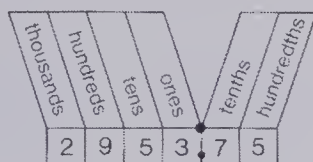
Expanded form:  $3000 + 100 + 50 + 2 + 0.4 + 0.06$

## Exercises

Read these numerals.



2.



3.



Write numerals for each.

4. 2 thousands, 4 hundreds, 6 tens, 3 ones, 5 tenths, 8 hundredths

2463.58

5. 6 thousands, 0 hundreds, 3 tens, 8 ones, 2 tenths, 5 hundredths

6038.25

6. 8 thousands, 5 hundreds, 5 tens, 4 ones, 0 tenths, 6 hundredths

8554.06

7. 5 thousands, 9 hundreds, 0 tens, 6 ones, 3 tenths, 4 hundredths

5906.34

8.  $4000 + 200 + 30 + 6 + 0.7 + 0.02$

4236.72

9.  $6000 + 0 + 50 + 3 + 0.9 + 0.04$

6053.94

10.  $8000 + 400 + 0 + 5 + 0.2 + 0.03$

8405.23

11.  $5000 + 600 + 20 + 9 + 0 + 0.08$

5629.08

Place value: thousands to hundredths 15

## ANSWERS:

- seven thousand, two hundred five decimal four six
- two thousand, nine hundred fifty-three decimal seven five
- three thousand, ninety-two decimal five one

## ACTIVITIES

1. Students might enjoy playing "Greatest Number — Least Number" (as described on page 14 of the teaching notes). In this case, six spaces would be required with the decimal point included.

2. Use the overhead spinner to play the game "Make 5000". Spin the spinner 6 times, stopping after each spin to allow students to place the indicated digit in any of the unused spaces. The winner is that player(s) who is closest to 5000.

Sample play

(Six digits spun: 3, 3, 0, 8, 6, and 5.)

Player 1

Player 2

5 6 3 3 • 8 0 5 3 8 3 • 0 6

[Player 2 is closer to 5000.]

## Variations:

- (a) Each player calculates his or her score by finding the difference between 5000 and his or her own number.

Player 1

$$5633.80 - 5000 = 633.80$$

Player 2

$$5383.06 - 5000 = 383.06$$

Lowest total score after five rounds wins the game.

- (b) Play "Make 1000" or "Make 3000". Reduce the number of spins by one and play "Make 500".

## OBJECTIVE

To consolidate place-value skills from thousands to hundredths

## PACING

Level A All

Level B All

Level C All

## MATERIALS

abacus

## BACKGROUND

The display on this student page follows from the one on page 14 and attempts to show five major representations of a decimal.

1. *Reading and/or writing* Note that along with "decimal four six" as in the example, "point four six", and "and forty-six hundredths" are considered equally acceptable.

2. *Abacus* This is a symbolic model in "concrete form".

3. *Place-value chart* The place-value chart demonstrates nicely the exponential nature of our base 10 system.

4. *Meaning* The meaning is provided for each digit in the decimal.

5. *Expanded form* This demonstrates the additive nature of place value through expansion.

## SUGGESTIONS

**Initial Activity** Though the abacus is a concrete model (or semiconcrete if used in picture form), it is also highly symbolic. You may, therefore, wish to spend some time demonstrating its use. For example, there are not three thousand beads on the thousand's wire, but rather a representation — three "1 thousand" beads. Indicate the decimal point on the abacus by using magic marker or a dot of coloured paper.

Write two or three numbers on the chalkboard and ask student volunteers to represent each number on the abacus.

You may want to briefly review the place value of money in which dimes represent tenths and pennies represent hundredths.

## USING THE BOOK

Read through the display in the student's book together. Be sure to emphasize that one number (i.e., 3152.46) is shown or stated six ways. (See Background.)

Exercises 1 to 3 could be done orally. When Exercises 4 to 11 are completed, students could be asked to read the numbers aloud.



OBJECTIVE

To add and subtract decimals from ten thousand's to hundredth's place

PACING

- Level A All
- Level B All
- Level C All

RELATED AIDS

BFA PROB. SOLVING LAB II — 137.  
CALC. W/BK — 24, 47.

SUGGESTIONS

**Initial Activity** Encourage students to bring in new and used car ads from newspapers and other sources. Permit students to read orally the numbers in the ads (both in "money" form and in "decimal" form). Use this data or the example provided in the display in the student's book to reinforce the addition algorithm. Stress the idea of placement of the addends and the process of regrouping.

USING THE BOOK

Read through the display in the student's book together. You may wish to demonstrate the addition and subtraction calculations on the chalkboard to show how \$9054.48 and \$2082.50 were obtained. Draw the pupils' attention to the relationship between "total" and "add", and between "difference" and "subtract".

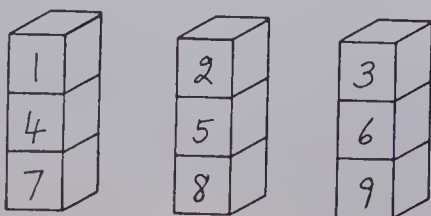
The answers for Exercises 1 and 5 are provided in the back of the student's text. You may wish to complete these two exercises orally. Caution the students to watch for the signs in Exercises 9 to 16.

ACTIVITIES

1. Using newspaper ads, select the best buy from a particular car lot. Students might select a set of ten or more prices and put them in order of value from least to greatest (to reinforce place value and comparison of numbers). Also, students could develop their own problems from the data.

2. Using the menu from a local restaurant, treat yourself to a meal of your choice! Find the total cost of the meal.

3. Challenge students with the "Baffling Boxes".



Car Auction

Mr. Ferguson buys used cars at the auction.



RALLY BLAZER  
\$3485.99



EAGLE MARK IV  
\$5568.49

What is the total cost of both cars?

Add.      \$3485.99  
              + 5568.49  
              -----  
              \$9054.48

The total cost is \$9054.48.

What is the difference in price?

Subtract.      \$5568.49  
                     - 3485.99  
                     -----  
                     \$2082.50

The difference in price is \$2082.50.

Exercises

Add.

1. \$2753.59 + 1248.99 ----- \$4002.58	2. \$3718.09 + 5272.49 ----- \$8990.58	3. \$6172.80 + 3086.45 ----- \$9259.25	4. \$1543.26 + 6177.38 ----- \$7720.64
---	---	---	---

Subtract.

5. \$7302.55 - 3728.29 ----- \$3574.26	6. \$8394.57 - 1648.92 ----- \$6745.65	7. \$9862.53 - 5481.16 ----- \$4381.37	8. \$4300.61 - 1648.75 ----- \$2651.86
---	---	---	---

Perform these operations.

9. 5358.43 + 2627.92 ----- 7986.35	10. 4681.25 - 2814.75 ----- 1866.50	11. 6172.83 + 3086.14 ----- 9258.97	12. 4552.60 - 1373.40 ----- 3179.20
13. 3094.28 + 1870.63 ----- 4964.91	14. 8062.15 - 3140.75 ----- 4921.40	15. 5000.03 + 2850.87 ----- 7850.90	16. 4064.33 - 1688.52 ----- 2375.81

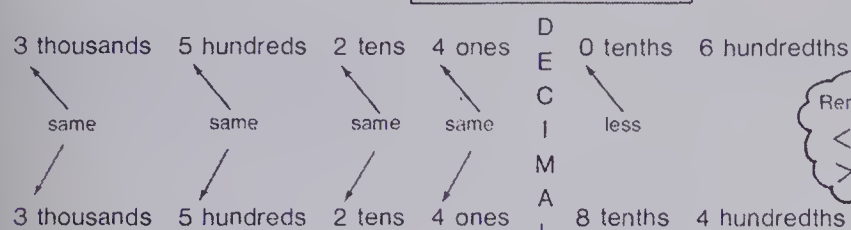
16 Addition, subtraction of decimals, thousands to hundredths

How many different ways can these nine boxes be arranged in 3 stacks of 3 so that no box has a number smaller than its own below it or to the right of it?

[There are 42 combinations. Hint: The numbers 1 and 9 are always in the same position.]

## Let's Compare

3524.06 and 3524.84



3524.06 < 3524.84

Remember!

< means "is less than".

> means "is greater than".

### Exercises

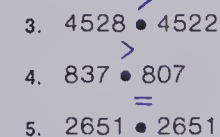
Compare. Use =, <, or >.

1. 356 and 349



356 > 349

2. 617 and 652



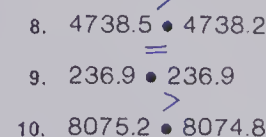
617 < 652

3. 267.4 and 267.2



267.4 > 267.2

4. 524.2 and 524.6



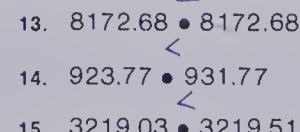
524.2 < 524.6

5. 437.92 and 437.98



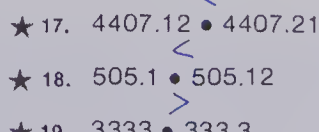
437.92 < 437.98

6. 206.53 and 206.51



206.53 > 206.51

7. 454.5 and 455.4



454.5 < 455.4

8. Place these decimals in order from smallest to largest.

55.39 553.9 55.49 554.9 55.5 55.39, 55.49, 55.5, 553.9, 554.9

Comparison of decimals 17

## OBJECTIVE

To compare decimals using the symbols =, >, or <

## PACING

Level A 1-15

Level B 4-17, 20

Level C 1-10, 16-20

## SUGGESTIONS

**Initial Activity** Consider using the display in the student's book to introduce the procedure for comparing one number to another. In some cases, students understand the procedure and the relative value of the numbers, but are confused as to which symbol properly represents the relationship. You might help students develop a "trick" to help them. For example, "The alligator's mouth always opens towards the larger number."

48 < 59 13 > 6

## USING THE BOOK

Clarify for the students what is being demonstrated at the top of the pupil page:

(a) 3524.06 is being compared to 3524.84 to find which is the greater number;

(b) the numbers are rewritten in simplified expanded form, i.e., "3 thousands 5 hundreds ...";

(c) decimal places are aligned;

(d) the thousand's number of each is compared, followed by the hundred's number of each, and so on. Emphasize why 3524.06 is less than 3524.84.

[because it has 0 tenths compared to 8 tenths]

Complete Exercises 1, 6, and 11 orally. Point out that the task is made easier by rewriting the two numbers so that decimal points are aligned. You may wish to complete Exercises 2, 7, and 12 orally as well. The answers for these are at the back of the student's text.

Exercises 16 to 20 require a good understanding of decimals and place value.

## ACTIVITIES

1. At random choose four or five numbers appearing in the newspaper. Have students put them in order from least to greatest.

2. Have students investigate the used car section of the newspaper. Find each of these.

(a) a car which costs less than \$2000.00  
(b) a car which costs more than \$5000.00

(c) 2 cars which cost the same

(d) the car which costs the most and the car which costs the least, then calculate the difference in price

(e) 5 cars or trucks of the same year.

Place the prices in order from least to greatest.

3. Play the game "Greater Than" (for 2 players). Using 40 file cards (or blank playing cards), write one randomly assigned number between 99 and 9999 on each of the 40 cards.

**Examples**

159.14 308.5 6799.8 4001.77

(a) Place the 40 cards face down. Each player draws 1 card.

(b) The player with the greater number claims both cards.

(c) Play continues until all the cards are claimed. The winner is that player with the most cards.





Some problems have 2 or more parts  
Read each problem carefully.

6. The distance from Montreal to Honolulu is 7917 km. 5567 km  
How many kilometres more is this distance than the maximum range of the Smoothflight?  
How many kilometres less is this distance than the maximum range of the Stratosphere? 2283 km
7. The Smoothflight and Stratosphere are parked side by side.  
What is their total width? 87.94 m  
Will they fit side by side in a hangar that is 95.3 m wide? yes
8. Mount Everest is 8840 m high.  
How much higher can the Smoothflight fly? 1830 m  
How much higher can the Stratosphere fly? 4882 m
9. As a safety check, test pilot Craig Roberts flew the Smoothflight to its maximum range.  
Then he flew the Stratosphere to its maximum range.  
How many kilometres did he fly altogether? 12 550 km
10. The hangar door at Montgomery Airport is 15.82 m high.  
Which plane would fit through the door? Smoothflight 301  
How much higher is the door than the plane? 4.51 m
- ★ 11. There were 326 passengers on the Stratosphere 747 when it left Vancouver Airport  
At Calgary, 159 passengers got off.  
At Regina, 78 passengers got on.  
How many passengers were on the plane when it left Regina? 245  
How many empty seats were there? 116

## BRAINTICKLER

Put these blocks in the right order,  
then write the numeral.

(a)

9 hundreds

7 tenths

2 ones

5 hundredths

8 tens

4 thousands

4982.75

(b)

4 ones

9 hundredths

7 tens

3 tenths

5 hundreds

2 thousands

2574.39

2-step problems 19

## USING THE BOOK

If necessary, review Professor Q's four questions as outlined on page 4 of the pupil text and in the Chapter Overview for this chapter. Read through the word problems together to be certain that vocabulary does not impede the students.

Assign the exercises.

## ACTIVITIES

1. Obtain airline brochures from a travel agency. Students might enjoy calculating the cost of a flight to a city or country of their choice.

2. Students could use the data from the brochures to develop their own word problems. These problems could be added to the class collection for immediate extra practice or they could be used at a later time.

3. Students who have flown on commercial airlines might be willing to share some of their experiences with the class.

4. Some students might like to investigate the exchange rates between the Canadian dollar and foreign currencies.

## OBJECTIVE

To develop place value to hundred thousands

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

See the city names as listed in the chart in Exercise 1.

## RELATED AIDS

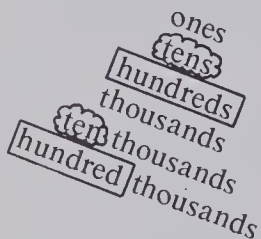
CALC. W/BK — 31.

## SUGGESTIONS

**Initial Activity** As an introduction to this lesson, you may want to discuss with students the various ways people communicate, e.g., telephone, radio, TV, satellite, telegraph, etc. Invite a person from your local telephone company to talk to students and to provide data. This data could be used initially to enhance the place-value chart illustrated in the display, and later, to develop word problems.

## USING THE BOOK

Investigate with students the pattern development in the place-value chart in the display in the student's book. This would help to emphasize the consistency of our number system.



Mathematicians have assigned *periods* to each set of three digits. These periods can assist students in reading and writing numbers.

Thousand's Period	One's Period
247	314

This number is read as "two hundred forty-seven *thousand*, three hundred fourteen".

Before assigning the exercises, you might ask students to read orally the numbers listed in the "Number of Telephones" column as a form of practice.

The exercises can be put in even wider context if a map of Canada is available for locating the various cities listed.

## Telephones

In 1976 the city of Halifax had 135 219 telephones.

Read and write as: "one hundred thirty-five thousand, two hundred nineteen".

Place-value chart:

hundred thousands	ten thousands	thousands	hundreds	tens	ones
1	3	5	2	1	9



Meaning: 1 hundred thousand, 3 ten thousands, 5 thousands, 2 hundreds, 1 ten, 9 ones

Expanded form:  $100\ 000 + 30\ 000 + 5\ 000 + 200 + 10 + 9$

### Exercises

1. Use the chart.

City	Number of Telephones	
Calgary	352 967	Read these numbers.
Edmonton	329 239	
Hamilton	199 119	
Kitchener	109 654	
London	165 435	Write these on a place-value chart.
Ottawa	417 377	
Quebec City	252 835	
Regina	105 655	
Vancouver	417 372	Write these in expanded form, then in words.
Victoria	130 049	
Windsor	118 820	
Winnipeg	372 822	

2. Which city in the list has the

(a) greatest number of telephones?

*Ottawa*

(b) fewest number of telephones?

*Regina*

20 Place value: hundred thousands

## ACTIVITIES

1. Some students might like to explore the cost of a 10 min telephone call from their town or city to a city in a foreign country.

2. Have a group of students find their family names in the telephone book. Have them select 40 numbers at random on that page and add the last two digits of each number.

**Examples**

578-632  $5 \rightarrow 2 + 5 = 7$

571-408  $6 \rightarrow 8 + 6 = 14$

Have students record their results. Do some numbers occur more often than others? Results could be illustrated in a simple bar graph.

3. Play the game "Make a Hundred Thousand". Draw a simple

place-value chart as follows. Roll an ordinary die seven times. After each roll, place the number showing in one of the two columns. The object of the game is to make a sum as close to one hundred thousand as possible.

**Sample Play**

Rolls	Ten Thousands	Thousands
1		6
2	2	
3	1	
4		5
5	3	
6		4
7	1	

7 ten thousands + 15 thousands =  
 $70\ 000 + 15\ 000 = 85\ 000$

## More Telephones

Calgary has 352 967 telephones.  
Vancouver has 417 372 telephones.  
How many telephones altogether?

$$\begin{array}{r} \text{Add.} \quad 352\,967 \\ + 417\,372 \\ \hline 770\,339 \end{array}$$

Ottawa has 417 377 telephones.  
Hamilton has 199 119 telephones.  
How many more telephones in Ottawa?

$$\begin{array}{r} \text{Subtract.} \quad 417\,377 \\ - 199\,119 \\ \hline 218\,258 \end{array}$$



## OBJECTIVE

To add and subtract 6-digit whole numbers

## PACING

Level A 1-8, 13-20  
Level B 5-12, 17-24  
Level C 1-6, 13-18

## RELATED AIDS

BFA PROB. SOLVING LAB II — 20.  
CALC. W/BK — 32.

## SUGGESTIONS

**Initial Activity** Review the process used for regrouping in addition and subtraction. Encourage those students who are able to handle the regrouping process mentally. Other students may still require the use of "helper numbers".

## USING THE BOOK

As you move about the room, check the answers for the first two questions done by each student. If the answers are correct, allow those pupils to carry on. If the answers of some students are incorrect, you will want to diagnose the difficulties. In some cases, lack of skill with basic addition facts may cause problems. Other students may still be unsure of the regrouping process.

You may want to repeat this process for the subtraction exercises.

### Exercises

Add.

1. $\begin{array}{r} 424\,155 \\ + 319\,268 \\ \hline 743\,423 \end{array}$	2. $\begin{array}{r} 337\,183 \\ + 164\,772 \\ \hline 501\,955 \end{array}$	3. $\begin{array}{r} 517\,687 \\ + 172\,833 \\ \hline 690\,520 \end{array}$	4. $\begin{array}{r} 209\,495 \\ + 427\,812 \\ \hline 637\,307 \end{array}$
5. $\begin{array}{r} 436\,611 \\ + 352\,967 \\ \hline 789\,578 \end{array}$	6. $\begin{array}{r} 100\,539 \\ + 314\,924 \\ \hline 415\,463 \end{array}$	7. $\begin{array}{r} 226\,653 \\ + 705\,465 \\ \hline 932\,118 \end{array}$	8. $\begin{array}{r} 340\,908 \\ + 186\,529 \\ \hline 527\,437 \end{array}$
9. $\begin{array}{r} 191\,982 \\ + 245\,438 \\ \hline 437\,420 \end{array}$	10. $\begin{array}{r} 470\,791 \\ + 133\,221 \\ \hline 604\,012 \end{array}$	11. $\begin{array}{r} 112\,492 \\ + 759\,066 \\ \hline 871\,558 \end{array}$	12. $\begin{array}{r} 523\,407 \\ + 280\,817 \\ \hline 804\,224 \end{array}$
Subtract.			
13. $\begin{array}{r} 388\,622 \\ - 109\,357 \\ \hline 279\,265 \end{array}$	14. $\begin{array}{r} 333\,412 \\ - 198\,802 \\ \hline 134\,610 \end{array}$	15. $\begin{array}{r} 654\,006 \\ - 187\,417 \\ \hline 466\,589 \end{array}$	16. $\begin{array}{r} 407\,214 \\ - 148\,506 \\ \hline 258\,708 \end{array}$
17. $\begin{array}{r} 500\,073 \\ - 296\,523 \\ \hline 203\,550 \end{array}$	18. $\begin{array}{r} 871\,046 \\ - 328\,528 \\ \hline 542\,518 \end{array}$	19. $\begin{array}{r} 622\,471 \\ - 301\,851 \\ \hline 320\,620 \end{array}$	20. $\begin{array}{r} 533\,281 \\ - 217\,904 \\ \hline 315\,377 \end{array}$
21. $\begin{array}{r} 716\,075 \\ - 342\,829 \\ \hline 373\,246 \end{array}$	22. $\begin{array}{r} 365\,681 \\ - 118\,454 \\ \hline 247\,227 \end{array}$	23. $\begin{array}{r} 500\,003 \\ - 125\,417 \\ \hline 374\,586 \end{array}$	24. $\begin{array}{r} 624\,118 \\ - 261\,573 \\ \hline 362\,545 \end{array}$

Addition, subtraction, 6-digit numbers 21

## ACTIVITIES

1. Play the game "Make a Hundred Thousand" as described on page 20 of the teaching notes.

2. Provide extra subtraction practice by introducing students to "6174".

(a) Have each student choose any 4-digit number, e.g., 4258.

(b) Arrange the digits to make the greatest and least possible numbers, then subtract.

$$\begin{array}{r} 8542 \\ - 2458 \\ \hline 6084 \end{array}$$

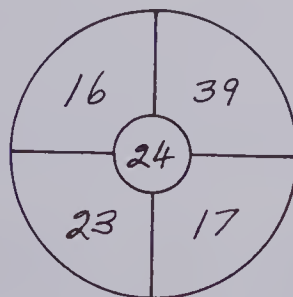
(c) Repeat step (b) with the new number. Within 7 cycles, the number "6174" will appear if no errors have been made. This means, of course, that this activity is self-checking.

$$\begin{array}{r} 8542 \\ - 2458 \\ \hline 6084 \end{array} \xrightarrow{\text{rearrange}} \begin{array}{r} 8640 \\ - 0468 \\ \hline 8172 \end{array} \xrightarrow{\text{rearrange}} \begin{array}{r} 8721 \\ - 1278 \\ \hline 7443 \end{array} \xrightarrow{\text{rearrange}} \begin{array}{r} 7641 \\ - 1467 \\ \hline 6174 \end{array}$$

Note that the cycle will not continue past 6174 because the number merely repeats itself.

(d) Ask students, "Did anyone reach 6174 after 4 cycles? 5 cycles? 6 cycles?" Have students try other 4-digit numbers.

3. Challenge your students with this target practice puzzle.



This target was hit with 6 shots for a total score of 100. What were the six shots?

$$[16 + 16 + 17 + 17 + 17 + 17 = 100]$$



## OBJECTIVE

To develop place value to ten millions

## PACING

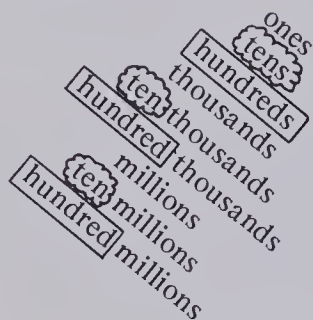
Level A All  
Level B All  
Level C All

## VOCABULARY

population, names of provinces as listed

## SUGGESTIONS

**Initial Activity** You may want to extend the pattern development of our number system as suggested on page 20 of the teaching notes. Notice how the repetitive pattern lends consistency to the base 10 system.



Also extend the period development as suggested on page 20 of the teaching notes to aid in reading numbers.

Million's Period	Thousand's Period	One's Period
105	273	118

This number is read as: "One hundred five million, two hundred seventy-three thousand, one hundred eighteen".

## USING THE BOOK

Have students read orally the populations of Canada, the provinces, and the territories as listed in the pupil display. If the populations are read aloud, then omit Exercise 2 when assigning the page.

## ACTIVITIES

1. Have students locate the current population of Canada and compare it to the 1976 total shown on the student's page. Ask, "Has the population increased or decreased? By how much?"

2. Some students may wish to investigate the size of populations of nearby cities and towns. Populations could be recorded in size from least to greatest.

## Population



Read and write as: "twenty-two million, nine hundred ninety-eight thousand".

hundred millions	ten millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones
	2	2	9	9	8	0	0

Place-value chart:

Population of Canada  
22 998 000

Meaning: 2 ten millions, 2 millions, 9 hundred thousands, 9 ten thousands, 8 thousands, 0 hundreds, 0 tens, 0 ones

1. Alberta	1 804 000	7. Nova Scotia	830 000
2. British Columbia	2 481 000	8. Ontario	8 290 000
3. Manitoba	1 023 000	9. Prince Edward Island	120 000
4. New Brunswick	684 000	10. Quebec	6 224 000
5. Newfoundland	554 000	11. Saskatchewan	929 000
6. Northwest Territories	40 000	12. Yukon Territory	19 000

### Exercises

- List those provinces and territories with populations (a) less than one million (b) more than one million.
- Read the populations of the first eight provinces and territories in the list.
- Write the populations of the last four provinces and territories in the list using expanded form.
- Write in order from least to greatest the populations of Newfoundland, Prince Edward Island, Saskatchewan, Nova Scotia, and New Brunswick. *120 000; 554 000; 684 000; 830 000; 929 000*

22 Place value: ten millions

### ANSWERS:

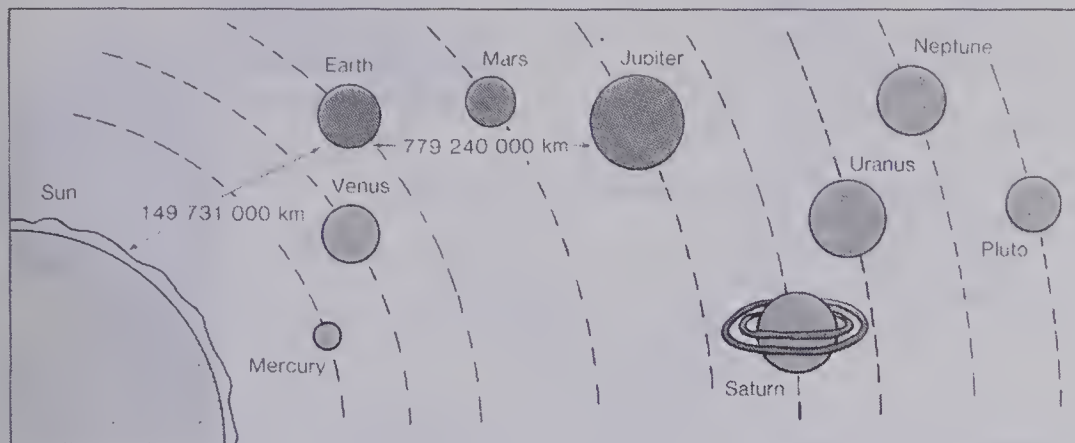
- (a) New Brunswick, Newfoundland, Northwest Territories, Nova Scotia, Prince Edward Island, Saskatchewan, Yukon Territory. (b) Alberta, British Columbia, Manitoba, Ontario, Quebec
- 1 hundred thousands, 2 ten thousands, 0 thousands, 0 hundreds, 0 tens, 0 ones  
6 millions, 2 hundred thousands, 2 ten thousands, 4 thousands, 0 hundreds, 0 tens, 0 ones  
9 hundred thousands, 2 ten thousands, 9 thousands, 0 hundreds, 0 tens, 0 ones  
1 ten thousands, 9 thousands, 0 hundreds, 0 tens, 0 ones

3. Use an almanac or encyclopedia to find the populations of ten other countries. Compare those figures to the population of Canada. Place the populations, including Canada's, in order of size from least to greatest.

4. Play the game "Make a Million".

- Using 5 blank dice, place the numbers 1, 10, 100, 1000, 10 000, and 100 000 — one on each face of every die.
- A player rolls 5 dice and sums the numbers showing on the upturned faces. The sum represents the player's score. For example,  
 $100\,000 + 100\,000 + 1000 + 10 + 1 = 201\,011$
- The first person to reach a million wins.

## Solar Facts



John discovered some facts about the solar system while in the library.

Give the meaning of each underlined digit.

Read each number first.

- Mars is about 55 706 000 km from Earth.  
(a) 5 means 5 millions. (b) 6 means 6 thousands
- Earth is about 149 731 000 km from the sun. 4 ten millions, 7 hundred thousands
- Jupiter has a diameter of 142 807 km. 2 thousands, 7 ones
- It takes Pluto about 266 820 h to make one revolution around the sun. 2 hundred thousands, 8 hundreds
- Venus is about 41 860 000 km from Earth. 1 million, 6 ten thousands
- Mercury is about 57 960 000 km from the sun. 5 ten millions, 9 hundred thousands
- The diameter of Saturn including the rings is 185 762 km. 1 hundred thousands, 6 tens
- It would take about 1 787 040 min for a spaceship to travel from Earth to Saturn. 1 million, 8 ten thousands
- Jupiter is about 779 240 000 km from Earth. 7 hundred millions, 9 millions

Place value: hundred millions 23

## OBJECTIVE

To provide practice with place value up to hundred millions

## PACING

Level A All

Level B All

Level C All

## SUGGESTIONS

**Initial Activity** As an introduction to this lesson, you may want to place a number of library books and magazines around the room which deal with space, astronomy, satellites, the solar system, and so on. You may want to discuss with students the vast distances involved in space and talk about the fact that many of us have some difficulty in "getting a feel for" a distance of 55 000 000 km. Scientists often use an analogy to help put the size of a number (or a distance) into some kind of perspective.

**Example**

The distance from Earth to Mars is about 55 706 000 km.

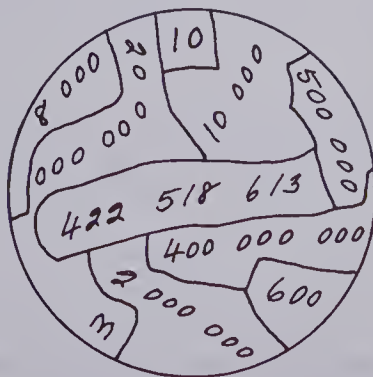
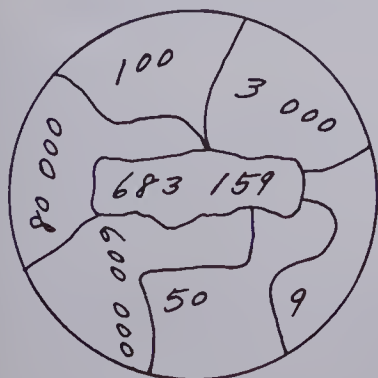
If you rode your bicycle nonstop at 20 km/h, it would take you 2 785 300 h to get to Mars or about 318 a!

## USING THE BOOK

Be sure that students understand that they are to give the value of the underlined digits only. Encourage students to work through this exercise without reference to a formal place-value chart.

## ACTIVITIES

- Prepare "Puzzle Plates", examples of which are shown, using paper pie plates cut in jig-saw fashion.



Pupils are required to use their knowledge of expanded notation and place value to reassemble the plates. The task can become quite challenging,

especially when the pieces of 4 or 5 plates are mixed together.

2. Some students who are interested in space and our solar system might investigate other interesting facts. These facts could be reported to the class.

3. Some students might wish to investigate units of measurement used by scientists to describe distances in space, e.g., light year and parsec.



## OBJECTIVE

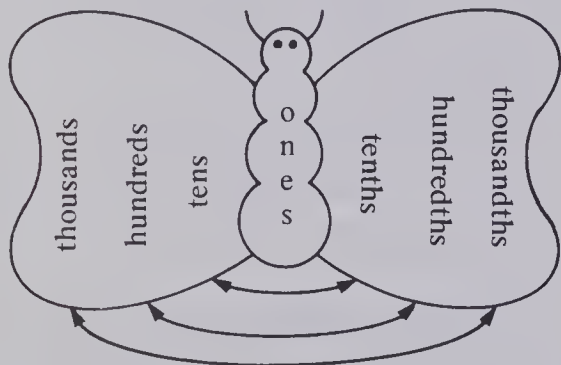
To develop place value to thousandths

## PACING

- Level A 1-5, then odd-numbered exercises  
 Level B 1-5, then even-numbered exercises  
 Level C 1-5, then last two questions in each row

## SUGGESTIONS

**Initial Activity** This would be an appropriate time to review and consolidate place-value skills for tenths and hundredths. As you introduce thousandths, you may want to use the "Base 10 Butterfly" which illustrates the symmetrical aspect of our numeration system.



## USING THE BOOK

Emphasize that 46.352 is indicated in 6 different ways in the display at the top of the student's page. Ask, "Can you find the 6 ways?" [i.e., 46.352; forty-six decimal three five two; forty-six and three hundred fifty-two thousandths; place-value chart; the meaning as 4 tens, 6 ones, etc.; expanded form] When the 6 ways have been identified, you may wish to repeat the demonstration using other numbers.

Complete Exercises 1 to 5 orally. For Exercises 6 to 25, be certain that the students are familiar with the accepted answer format.

## ACTIVITIES

See the numerous place-value activities on teaching-note pages 11, 13, 14, 15, 20, and 23. Modify them to suit this page (i.e., to thousandths) and the needs of the class.

## EXTRA PRACTICE

- Write each number in a place-value chart.  
 (a) 21.361 (b) 44.986 (c) 83.225  
 (d) 11.056 (e) 72.227

## Thousandths

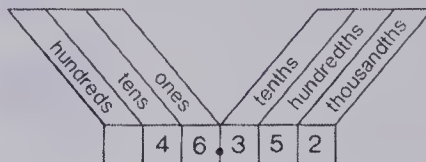
Consider the number 46.352.

Read as: "forty-six decimal three five two"  
or

"forty-six and three hundred fifty-two thousandths".

46.352

Place-value chart:



Meaning: 4 tens, 6 ones, 3 tenths, 5 hundredths, 2 thousandths

Expanded form:  $40 + 6 + 0.3 + 0.05 + 0.002$



### Exercises

Read these numbers.

- 0.001
- 14.024
- 85.006
- 36.029
- 68.124

Draw a place-value chart and place each number on the chart.

- 16.043
- 75.307
- 12.754
- 50.197
- 63.002

Write the meaning.

- 46.352
- 60.483
- 18.046
- 37.509
- 71.008

Write in expanded form.

- 26.013
- 39.005
- 40.172
- 83.505
- 61.541

Write the value of each underlined digit.

- 37.924
- 43.275
- 80.471
- 29.606
- 72.093

24 Place value, thousandths

### ANSWERS:



- 4 tens, 6 ones, 3 tenths, 5 hundredths, 2 thousandths
- 6 tens, 0 ones, 4 tenths, 8 hundredths, 3 thousandths
- 1 ten, 8 ones, 0 tenths, 4 hundredths, 6 thousandths
- 3 tens, 7 ones, 5 tenths, 0 hundredths, 9 thousandths
- 7 tens, 1 one, 0 tenths, 0 hundredths, 8 thousandths
- $20 + 6 + 0.01 + 0.003$
- $30 + 9 + 0.005$
- $40 + 0.1 + 0.07 + 0.002$
- $80 + 3 + 0.5 + 0.005$
- $60 + 1 + 0.5 + 0.04 + 0.001$
- 2 hundredths
- 5 thousandths
- 4 tenths
- 2 tens
- 3 thousandths

- Write the meaning and expanded form of each.  
 (a) 16.651 (b) 31.556 (c) 62.944  
 (d) 29.207 (e) 44.947

- Write the value of each underlined digit in Exercises 1 and 2.



## Fascinating Facts!

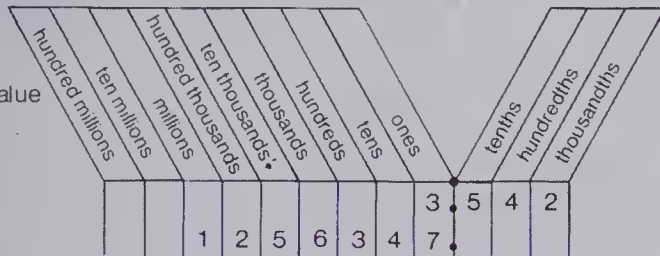


The "Jet Car" covered  
1 km in 3.542 s.

Meaning:  
3 ones, 5 tenths, 4 hundredths,  
2 thousandths

Place-value  
chart:

Read:  
"one million, two hundred  
fifty-six thousand, three  
hundred forty-seven".



An earthworm would cover  
the same distance in  
1 256 347 s.

Meaning:  
1 million, 2 hundred  
thousands, 5 ten thousands,  
6 thousands, 3 hundreds,  
4 tens, 7 ones

Read:  
"three decimal five four two"  
or  
"three and five hundred  
forty-two thousandths".

### Exercises

Use one of the forms to express each of the following numbers.

1. Your heart will beat about 1 620 000 times in fifteen days.
2. A sheet of paper is about 0.05 mm thick.
3. The oldest moon rocks brought back by the Apollo crew are about 4 720 000 a (years) old.
4. The shortest millipede is about 0.023 cm long.
5. The "Beatles" rock group sold about 545 000 000 records.
6. The earth travels around the sun at a rate of 107 290.4 km/h.

Answers will  
vary.

Place value: hundred million to thousandths 25

## OBJECTIVE

To consolidate place value from  
millions to thousandths

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

earthworm, heart, Apollo crew,  
millipede

## RELATED AIDS

HMS — DM4.

## SUGGESTIONS

**Initial Activity** You may wish to discuss with your students the need in today's world to have access to, and the ability to work with, large and small numbers. The *Guinness Book of World Records* and the *World Almanac* are two sources which provide an amazing fund of numbers, including distances between galaxies to measurements of molecules. In addition, these books contain records and facts that many students find intriguing. Before assigning the exercises, you might have some "amazing facts" ready to discuss with your students. This approach might, in a limited way, put the number values into perspective.

## USING THE BOOK

Read through the display at the top of the pupil's page together. Emphasize the difference in speed between the car and the earthworm. Point out that both numbers, 1 256 347 and 3.542, have been placed in the same place-value chart.

Read through the exercises together. Have the students express the numbers in each statement in one (or all) of the forms listed in the display (i.e., meaning, in a place-value chart, or as it would be read).

## ACTIVITIES

1. Many place-value games and activities have been listed in the teaching notes on pages 11, 13, 14, 15, 20, and 23.

2. Provide pupils with blank paper and a spinner numbered from 0 to 9. Players write a 12-digit number on the

blank paper. When each player has a personal number (and can read it aloud), one player uses the spinner to make a 12-digit "trump" number. Players compare their numbers to this trump number by using the process introduced on page 17 of the teaching notes. The player with the closest number wins the round.

## OBJECTIVE

To solve word problems involving addition and subtraction

## PACING

Level A All

Level B All

Level C All

## RELATED AIDS

BFA COMP LAB II — 22, 24.

BFA PROB. SOLVING LAB II — 27.

CALC. W/BK — 9.

## SUGGESTIONS

**Initial Activity** Use the description of a pharmacist in the Career Awareness section of the Chapter Overview as a basis for discussion with the class. You may also wish to display Professor Q's steps to problem solving on a bulletin board for reference while completing this page.

## USING THE BOOK

If necessary, review the format you have established for problem solving. If you have not already done so, see the Chapter Overview notes with regard to problem solving at the beginning of this chapter.

Note that in Exercises 6 and 7, there is surplus information; that is, information not required to solve the problem is included.

## ACTIVITIES

1. Help students begin to write their own pharmacist word problems by supplying cards such as the following.

Ms. Carter ordered \$75.00 worth of \_\_\_\_\_.  
She also ordered \$65.50 worth of \_\_\_\_\_.  
How much did the order cost?

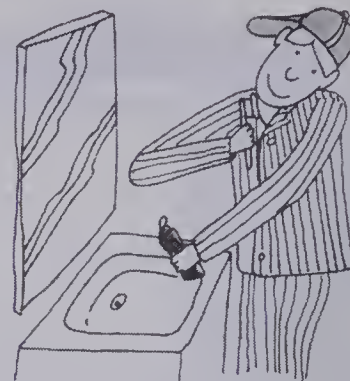
Mr. Harris ordered \_\_\_\_\_ boxes of \_\_\_\_\_.  
He also ordered \_\_\_\_\_ boxes of \_\_\_\_\_.  
How many more boxes of \_\_\_\_\_ did he order?

Mr. Park bought \$3.75 worth of shaving cream and razor blades.  
Ms. Hill bought \$3.99 worth of shampoo.  
\_\_\_\_\_?

The three cards are listed in order of difficulty. Each card becomes

## Pharmacist

1. The pharmacist counted 780 cold tablets in one container and 495 in another.  
How many cold tablets are there altogether? **1275**
2. The pharmacist filled two prescriptions for Mrs. Finley.  
One cost \$18.95; the other cost \$12.49.  
What was the total cost? **\$ 31.44**
3. Green pills cost \$12.25 a bottle.  
Red pills cost \$8.69 a bottle.  
How much more do the green pills cost? **\$ 3.56**
4. There were 3756 tubes of toothpaste sold the first year that the drugstore was open.  
During the second year, 4654 tubes were sold. There were 2065 tubes sold in the third year and 4507 tubes sold during the fourth year.  
How many tubes of toothpaste were sold during the four years? **14 982**
5. The pharmacist ordered some bottles of baby oil for \$127.60, some tins of baby powder for \$118.90, and some baby food for \$358.28.  
What was the total cost? **\$ 604.78**
6. A display holds 320 boxes of "Super Stick" band aids.  
There were 176 boxes sold.  
One box costs \$1.19.  
How many boxes are left in the display? **144**
- ★ 7. The "Home 'n Car" first aid kit cost \$41.35 last week.  
It is now on sale for \$25.99.  
There are only 12 kits on the shelf.  
What is the difference in price? **\$ 15.36**



increasingly more challenging to complete because more information is required in order for each pattern to make sense. Give the pupils plenty of practice completing cards like those shown at each level of difficulty. They may then be ready to attempt cards such as this.

Use these numbers and words to write a word problem.

- (a) 36, 48, baby food jars
- (b) \$2.85, \$1.99, deodorant



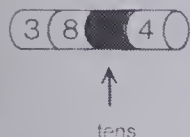
## Rounding Rollers

Murray wants to round 3874 to the nearest ten.

Here's how he does it!

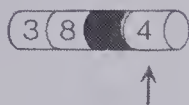
### Step 1

He finds the ten's digit



### Step 2

Murray finds the next digit to the right



### Step 3

If the digit on the right is 5 or greater, he rounds up. If it is 4 or less, the original digit remains the same



Why did Murray leave the digit "7" unchanged?

3874 rounds to 3870.

### Exercises

Round to the nearest *ten*

1.  $\begin{array}{|c|c|c|c|} \hline 2 & 5 & 6 & \\ \hline \end{array}$  rounds to  $\begin{array}{|c|c|c|c|} \hline 2 & 5 & 0 & \\ \hline \end{array}$  4781 **4780** 3. 8935 **8940**  
4. 5652 **5650** 5. 7138 **7140** 6. 4367 **4370** 7. 2682 **2680** 8. 3341 **3340**

Round to the nearest *hundred*.

9.  $\begin{array}{|c|c|c|c|} \hline 3 & 2 & 1 & \\ \hline \end{array}$  rounds to  $\begin{array}{|c|c|c|c|} \hline 3 & 0 & 0 & \\ \hline \end{array}$  6792 **6800** 11. 1375 **1400**  
12. 2813 **2800** 13. 7214 **7200** 14. 5932 **5900** 15. 4157 **4200** 16. 3313 **3300**

Round to the nearest *thousand*.

17.  $\begin{array}{|c|c|c|c|} \hline 7 & 2 & 8 & \\ \hline \end{array}$  rounds to  $\begin{array}{|c|c|c|c|} \hline 0 & 0 & 0 & \\ \hline \end{array}$  5861 **6000** 19. 4178 **4000**  
20. 8215 **8000** 21. 6549 **7000** 22. 3177 **3000** 23. 5462 **5000** 24. 7945 **8000**

Rounding to nearest 1 10, 100, 1000 27

## OBJECTIVE

To introduce rounding to the nearest one, ten, hundred, and thousand

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

CALC. W/BK — 26.

## SUGGESTIONS

**Initial Activity** You may want to discuss with students the reason for rounding numbers.

(a) We often use rounding when we require only an approximate answer.

$$\begin{array}{r} 374 \\ 218 \\ +193 \\ \hline 800 \end{array}$$

Rounding then becomes important for estimation skills.

(b) Newspaper headlines and advertisements often use rounded numbers. Many times there is no critical need for accuracy and sometimes exact figures are not available.

15 000 Fans Attend Homecoming Game!

28 000 Canadians Flew World Airlines Last Year.

(c) You might discuss with students times when it is not appropriate to round numbers. For example,

- (i) Date of birth: 1957 ("I'll round to 1960!")
- (ii) Telephone number: 524-7638 ("I'll round that to 525-0000!")
- (iii) Bus departure time: 08:45 ("I'll round that to 09:00!")

Encourage students to think of other occasions when it is appropriate and inappropriate to round numbers.

The skill of rounding depends largely on a sound knowledge of place value. You may wish to spend some time reviewing the base 10 system with emphasis on ones to thousands.

records the original number as directed. If correct, the second player takes a score equal to the digit in the place-value location indicated by the second spinner. (For example, twirls yield 4632 and hundreds. When rounded, 4632 yields 4600; 6 is in the hundreds position so score 6 for a correct rounding. Twirl 8474 and tens; then score 7.) The players switch roles. The player with the highest total score after 5 turns wins.

## USING THE BOOK

Use the pupil display to develop the procedure for rounding whole numbers. It is important that students understand that, because we are dealing with whole numbers, zeros are used as place-holders for those digits dropped: 2468 rounded to the nearest ten is 2470, *not* 247. The zero is important because it indicates "no ones". Be sure that students understand why the "7" in the display remains unchanged.

Before assigning the exercises, decide on an appropriate symbol that shows the relationship between the original number and the rounded number. Avoid the use of an equal sign. That is,  $3874 = 3870$  is not true. Rather, use an arrow, or introduce the symbol " $\approx$ " which means "is approximately equal to".

$$3874 \rightarrow 3870 \text{ or } 3874 \approx 3870$$

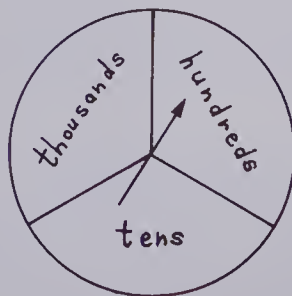
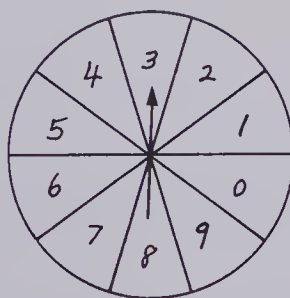
## ACTIVITIES

1. Play "Concentration" as described in the Activity Reservoir. Use cards such as these.

$$2562 \rightarrow \text{hundred?} \leftrightarrow 2600$$

$$3827 \rightarrow \text{thousand?} \leftrightarrow 4000$$

2. Provide players with two spinners as shown.



The first player (or team member) uses the numeral spinner to make a 4-digit number. The second player (or team member) twirls the second spinner and



OBJECTIVE

To introduce rounding to the nearest one tenth and hundredth

PACING

- Level A All
- Level B All
- Level C All

RELATED AIDS

HMS — DM5.

SUGGESTIONS

**Initial Activity** The skill of rounding decimals, as well as whole numbers, depends largely on a sound knowledge of place value. You may wish to spend some time reviewing place value, particularly tenths and hundredths.

USING THE BOOK

Use the pupil display to develop the three steps used in rounding. While not stated explicitly in Step 3, students should be aware that all digits to the right of the rounded digit are dropped or discarded (i.e., the number is truncated).

Note that Steps 1 and 2 have been included in the charts for Exercises 1 and 2 only to illustrate the process of rounding. It is not expected that students should have to complete these two columns. Rather, these steps should be handled mentally.

Similarly, Exercise 3 demonstrates the process. Students need only use the format suggested on page 27.  
 $63.246 \approx 63$  or  $63.246 \rightarrow 63$

ACTIVITIES

- See the Activities section on page 27 of the teaching notes. Have the students help modify the activities to include rounding to the nearest tenth and hundredth.
- Provide students with "Round-It" grids as shown for completion.

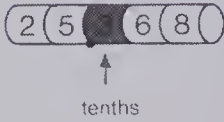
Number	Rounded to nearest		
	whole number	tenth	hundredth
63.416 →	63	63.4	63.42
19.157 →	19	19.2	[19.16]
44.336 →	[44]	44.3	[44.34]
8.914 →	9	[8.9]	[8.91]
12.265 →	[12]	[12.3]	12.27
438.864 →	[439]	[438.9]	[438.86]
6.505 →	7	[6.5]	[6.51]
0.876 →	[1]	0.9	[0.88]
508.375 →	[508]	[508.4]	[508.38]
0.319 →	[0]	[0.3]	[0.32]

More Rounding Rollers

Brenda wants to round 25.368 to the nearest tenth. She uses 3 steps also!

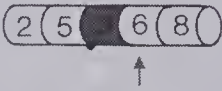
Step 1

She finds the tenth's digit.



Step 2

She finds the next digit to the right.



25.368 rounds to 25.4.

Step 3

If that digit on the right is 5 or greater, she rounds up. If it is 4 or less, the original digit remains the same.



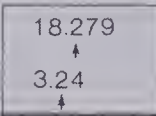
Why did Brenda round up?

Exercises

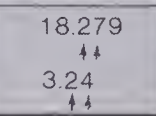
1. Round to the nearest tenth.

- (a) 18.279
- (b) 3.24 → 3.2
- (c) 7.683 → 7.7
- (d) 96.15 → 96.2
- (e) 56.71 → 56.7

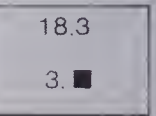
Step 1



Step 2



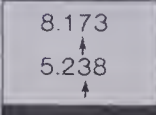
Step 3



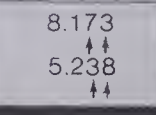
2. Round to the nearest hundredth.

- (a) 8.173
- (b) 5.238 → 5.24
- (c) 16.375 → 16.38
- (d) 4.981 → 4.98
- (e) 7.042 → 7.04

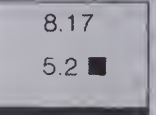
Step 1



Step 2



Step 3



Use the 3 steps to round to the nearest whole number.

- 3. 72.617 → 72.617 → 72.617 → 73
- 4. 63.246 → 63
- 5. 27.6 → 28
- 6. 548.1 → 548
- 7. 64.271 → 64
- 8. 561.8 → 562
- 9. 6.5 → 7
- 10. 40.23 → 40

28 Rounding to nearest 1,  $\frac{1}{10}$ ,  $\frac{1}{100}$

EXTRA PRACTICE

- Round each to the nearest tenth.  
(a) 12.146 (b) 44.48 (c) 306.93  
(d) 7.05 (e) 13.13
- Round each to the nearest hundredth.  
(a) 8.456 (b) 16.677 (c) 177.811  
(d) 0.544 (e) 25.101
- Round each number in Exercises 1 and 2 to the nearest whole number.

# People and Provinces

Population of Certain Canadian Provinces.

Ontario	8 290 145
Quebec	6 224 214
British Columbia	2 481 231
Alberta	1 803 681
Manitoba	1 022 938
Saskatchewan	929 090
Newfoundland	554 497
Prince Edward Island	120 048

Round to the nearest million to estimate the combined population of Ontario and Saskatchewan.  
 8 290 145 → 8 000 000  
 929 090 → 1 000 000  
 Estimated sum is 9 000 000.

Remember!  
 Use the  
 "three steps"

## Exercises

Round to the nearest million to estimate the combined population of:

- Quebec and Ontario 14 000 000
- British Columbia and Alberta 4 000 000
- Manitoba and Saskatchewan 2 000 000
- Alberta and Newfoundland 3 000 000
- 4 western provinces 6 000 000
- 3 provinces with largest populations 16 000 000
- Prince Edward Island and Saskatchewan 1 000 000
- Newfoundland and Prince Edward Island. 1 000 000

Round to the nearest million to estimate the differences in population.

- Ontario and Quebec 2 000 000
- British Columbia and Alberta 0
- Alberta and Saskatchewan 1 000 000
- Manitoba and Saskatchewan 0
- Newfoundland and Prince Edward Island 1 000 000
- Manitoba and Newfoundland 0

Round to the nearest hundred thousand to better estimate the differences in the population of:

- Manitoba and Saskatchewan 100 000
- British Columbia and Alberta 700 000
- Manitoba and Newfoundland 400 000
- Saskatchewan and Newfoundland 300 000
- Newfoundland and Prince Edward Island 50 000
- Manitoba and Alberta. 800 000
- Round the population of each province to  
 (a) the nearest ten thousand (b) the nearest thousand.

Rounding to estimate sums and differences 29

## ANSWERS:

- Ontario: (a) 8 290 000 (b) 8 290 000
- Quebec: (a) 6 220 000 (b) 6 224 000
- British Columbia: (a) 2 480 000 (b) 2 481 000
- Alberta: (a) 1 800 000 (b) 1 804 000
- Manitoba: (a) 1 020 000 (b) 1 023 000
- Saskatchewan: (a) 930 000 (b) 929 000
- Newfoundland: (a) 550 000 (b) 554 000
- Prince Edward Island: (a) 120 000 (b) 120 000

## OBJECTIVE

To apply rounding skills to estimate sums and differences

## PACING

Level A All  
 Level B All  
 Level C All

## VOCABULARY

combined population

## RELATED AIDS

BFA PROB. SOLVING LAB II — 15.

## SUGGESTIONS

**Initial Activity** Review the 3-step procedure for rounding numbers and review place value to millions.

## USING THE BOOK

Use the display in the student's book to help illustrate how numbers are rounded and then added to provide an estimated sum.

Then ask, "What is the estimated difference in population between Ontario and Saskatchewan?"  
 [7 000 000]

You may want to ask students to read orally the populations listed in the display in order to provide place-value practice.

## ACTIVITIES

1. You may wish to prepare a "Round It" grid for distribution which includes rounding to the nearest thousand, ten thousand, hundred thousand, and million.

Number	Rounded to nearest			
	thousand	ten thousand	hundred thousand	million
1 336 448	1 336 000	[1 340 000]	[1 300 000]	[1 000 000]
927 336	[927 000]	[930 000]	[900 000]	[1 000 000]
5 605 869	[5 606 000]	[5 610 000]	[5 600 000]	[6 000 000]
3 347 515	[3 348 000]	[3 350 000]	[3 300 000]	[3 000 000]
8 719 464	[8 719 000]	[8 720 000]	[8 700 000]	[9 000 000]

2. You may wish to provide a large map of Canada which can be labelled (using paper slips) with actual and rounded population figures.

3. Some students might enjoy researching the latest population figures (available from Statistics Canada) for the eight provinces listed in the pupil text. Have them round off numbers (to nearest 1000) to determine population change.



## OBJECTIVE

To translate from Roman to modern numerals

## PACING

Level A All  
Level B All  
Level C All

## SUGGESTIONS

**Initial Activity** Students may not be familiar with all the letter representations of the numerals. You may wish to introduce a letter or two each day and post them on a bulletin board or chalkboard before beginning the exercises.

Discuss with students where they might find Roman numerals used: e.g., introductory pages in a book, copyright date on films, pendulum clock faces, and corner stones of old buildings.

## USING THE BOOK

Use the pupil display to present the process for translating a Roman numeral to a modern numeral. When translating, it is useful to think in terms of expanded notation. For example, in the numeral MDCXXXVII as illustrated in the display, each letter or combination of letters can be directly translated to a specific place value. These values, in expanded form, can then be added or combined to form the modern numeral 1637.

While most groups of letters are combined by addition, there are exceptions, as shown by the Roman numeral CDIX, where subtraction is used. These special cases are listed in Exercises 11 to 16.

Note that the symbol “ $\cap$ ” is used to indicate subtraction. It is not intended that students should use it. Rather, it is used simply as a reminder.

Some students will find it beneficial to translate Roman numerals by actually writing out the expanded form and then writing the modern numeral. Other students will be able to decode the Roman numeral mentally and simply write the modern numeral.

## ACTIVITIES

1. Prepare and distribute a matching activity as shown.

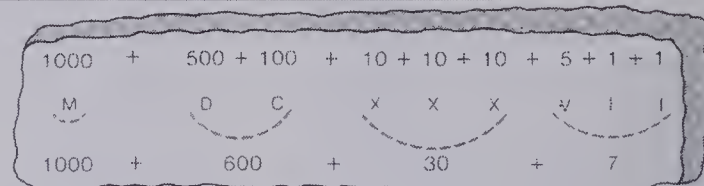
XX	61
DXLV	90
LXI	77
XCIX	20
XC	1660
XIV	545
MDCLX	14
LXXVII	99

## Roman Numerals

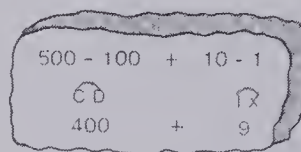
Roman Numerals	I	V	X	L	C	D	M
Our Numerals	1	5	10	50	100	500	1000

The Roman system uses addition and subtraction to form numbers

1637  
MDCXXXVII



409  
CDIX



### Exercises

Write our numerals.

- xxiii 23
- xvi 16
- lII 52
- clIII 153
- DCXXXV 635
- LXV 65
- DCC 700
- CLXX 170
- DXXVIII 528
- MDCXXIII 1623

Subtraction is used for special cases. Complete these special cases.

- IV 5 - 1 or 4
- XL 50 - 10 or 40
- CD 500 - 100 or 400
- IX 10 - 1 or 9
- XC 100 - 10 or 90
- CM 1000 - 100 or 900

Write our numerals. ( $\cap$  means subtract.)

- XLVI 46
- XCII 92
- XIV 14
- CDXLVIII 448
- CMXXXIV 934

Write our numerals.

- XIII 13
- LXXXVIII 88
- CMIX 909
- LXVI 66
- CCLXXVII 277

30 Roman numerals

2. Play “Concentration” as described in the Activity Reservoir. Use corresponding pairs of cards which show Roman numerals and our numerals.

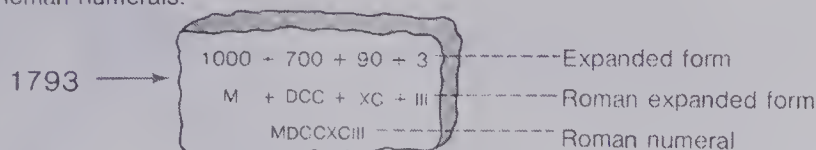
LIX	59	CXC	190
-----	----	-----	-----

3. Play “Bingo” as described in the Activity Reservoir. Have the pupils fill in each space on the Bingo sheets with our numerals from 0-30. Have the “caller” display Roman numerals using an overhead projector, cards, or a chalkboard.



# Writing Roman Numerals

Write 1793 in Roman numerals.



Exercises 1. I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII, XIV, XV, XVI, XVII, XVIII, XIX, XX  
2. X, XX, XXX, XL, L, LX, LXX, LXXX, XC, C

Write Roman numerals for: 3. C, CC, CCC, CD, D, DC, DCC, DCCC, CM, M


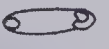



1. the numbers 1 to 20.
2. the numbers 10 to 100 (by tens).
3. the numbers 100 to 1000 (by hundreds).

Write Roman numerals.



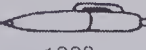


- 1975 MCMLXXV
- 2694 MMDCXCIV
- 1849 MDCCCXLIX
- 999 CMXCIX
- 259 CCLIX
- 473 CDLXXIII
- 551 DLI
- 844 DCCCXLIV

## INVENTIONS

12. Write in our numerals

(a)  MDCIX 1609	(b)  MDCCCXLIX 1849
(c)  MDCCLXXXV 1785	(d)  MCCXXXII 1232
(e)  MDXCIII 1593	

13. Write in Roman numerals.

(a)  1827 MDCCCXXVII	(b)  900 CM
(c)  1888 MDCCCLXXXVIII	(d)  1709 MDCCIX
(e)  1935 MCMXXXV	

Roman numerals 31

## OBJECTIVE

To translate from modern to Roman numerals

## PACING

Level A All  
Level B All  
Level C All

## SUGGESTIONS

**Initial Activity** Review the seven major letters used in Roman numerals as illustrated in the pupil display on page 30.

Write two or three modern numerals on the chalkboard and demonstrate the procedure for translating them into Roman numerals as illustrated in the display on page 31. Note that expanded notation is a useful device in the translation process.

## USING THE BOOK

Assign Exercises 1 to 3 and check the answers before proceeding to the remaining exercises.

## ACTIVITIES

1. Some students might like to investigate other ancient number systems: e.g., Greek, Babylonian, or Egyptian. Information on these number systems could be found in the school or local library. Students might illustrate these systems on large pieces of Bristol board. The rest of the class might enjoy translating from our numeral system to an ancient one and vice versa.

2. The computer uses its own numeration system called the "binary system". Only two digits are used: 0 and 1. Some students might wish to investigate this system further. Using Bristol board or large graph paper, have students list the numbers from 1

to 50 with the binary system. They might also present to the rest of the class the relationship between the base 10 and binary (base 2) systems.

Base 10				Base 2			
1000	100	10	1	16	8	4	2 1
			1				1
			2				1 0
			3				1 1
			4		1	0	0
			5		1	0	1
			6		1	1	0
			7		1	1	1
			8		1	0	0 0
			9		1	0	0 1
		1	0		1	0	1 0

3. Other students may wish to explore number systems in other bases, such as base 5.

Base 10	Base 5
1	1
2	2
3	3
4	4
5	10
6	11
7	12
8	13
9	14
10	20

## OBJECTIVES

To encourage students to investigate patterns and to make predictions based on those patterns

To encourage an awareness of relationships that exist between number and geometry

## PACING

Level A All

Level B All

Level C All

## VOCABULARY

geometric, triangular, square

## USING THE BOOK

While this page is designed essentially for those students who might enjoy exploring number patterns, you might encourage all students to attempt some solution. You could take this opportunity to observe the logic and problem-attack skills of your pupils.

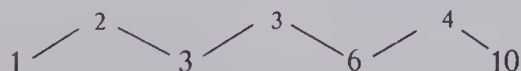
As students work through the exercises, encourage them to verbalize the patterns they see. For example, some students may visualize the triangular number in this way:



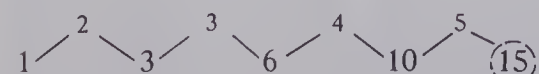
"The next row will need 5 dots; therefore, the next triangular number is  $10 + 5$  or 15."

Others may use this approach: "A triangular number can be expressed as the sum of consecutive natural numbers. Each triangular number in the series is calculated by adding the next consecutive number to the previous sum. 10 is expressed as  $1 + 2 + 3 + 4$ ; the next triangular number would be expressed as  $1 + 2 + 3 + 4 + 5$ , which is 15."

Some students may investigate the "difference" approach. For example, "The difference between each triangular number in the series increases by one each time."



"The difference between ten and the next triangular number must be one greater than 4, which is 5."

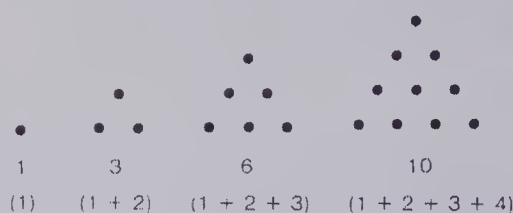


"Therefore, the next triangular number is 15."

## Geometric Numbers

Sometimes we can relate geometric shapes and numbers.

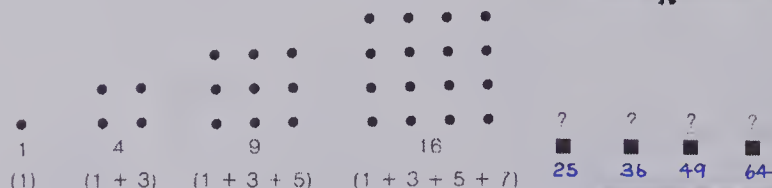
1. Here are the first four **triangular numbers**.



Use the pictures and number patterns to find the next four *triangular numbers*.

(Do you see other patterns that will help?)

2. Here are the first four **square numbers**.

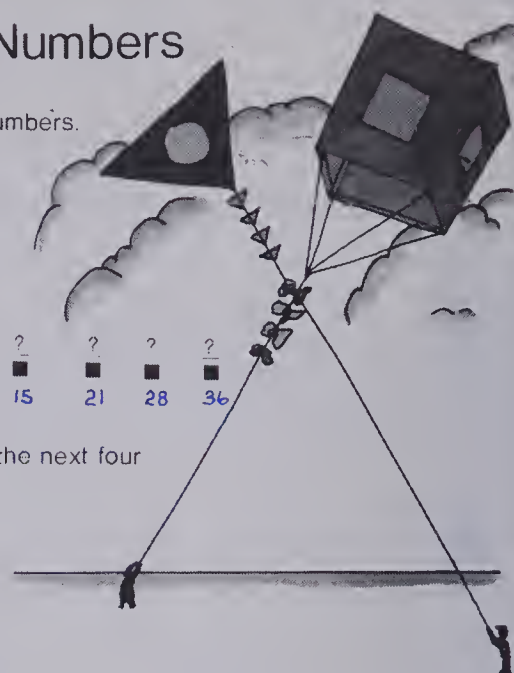


Use the pictures and number patterns to find the next four *square numbers*.

(Do you see other patterns that will help you?)

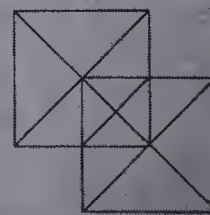
★ 3. Which of the following are *triangular numbers*?  
66, 75, 91, 120, 134 **66, 91, 120**

★ 4. Which of the following are *square numbers*?  
100, 121, 222, 289, 82 **100, 121, 289**



## BRAINTICKLER

How many triangles? **28**



Similar approaches may be used to investigate the patterns of square numbers.



"The next section will need 9 dots; therefore, the next square number is  $16 + 9$  or 25."

Some students may investigate the number series. Others may remember

the concept of the area of a square and use multiplication to find the square numbers. For example,

$$1 \times 1 = 1$$

$$2 \times 2 = 4$$

$$3 \times 3 = 9$$

$$4 \times 4 = 16$$

$$5 \times 5 = 25$$

$$6 \times 6 = 36$$

and so on.

If calculators are available in your classroom, students may wish to use them to investigate Exercises 3 and 4.

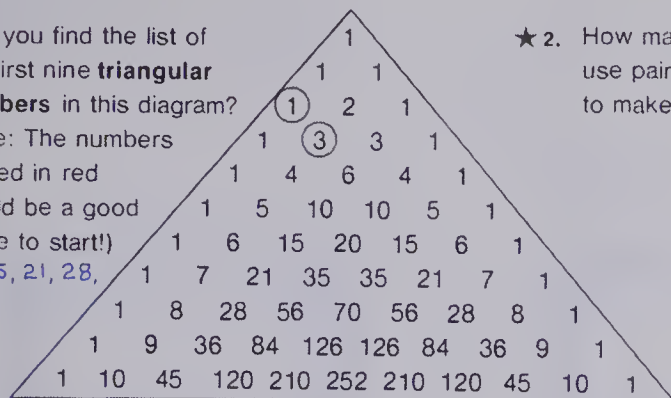
# Pascal's Triangle

Pascal's Triangle contains many patterns.

1. Can you find the list of the first nine **triangular numbers** in this diagram?

(Clue: The numbers circled in red would be a good place to start!)

1, 3, 6, 10, 15, 21, 28, 36, 45

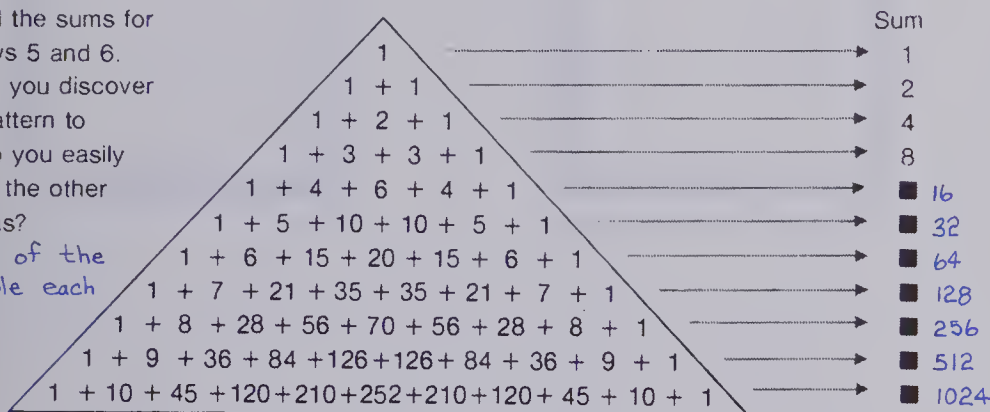


- ★ 2. How many ways can you use pairs of numbers to make **square numbers**?

**CHALLENGE:** Can you discover the pattern Pascal might have used to make his triangle? Clue: **THINK addition!**

3. Find the sums for Rows 5 and 6. Can you discover a pattern to help you easily find the other sums?

The sums of the rows double each time.



Activity Pascal's Triangle 33

## OBJECTIVE

To investigate patterns in Pascal's Triangle

## PACING

Level A All  
Level B All  
Level C All

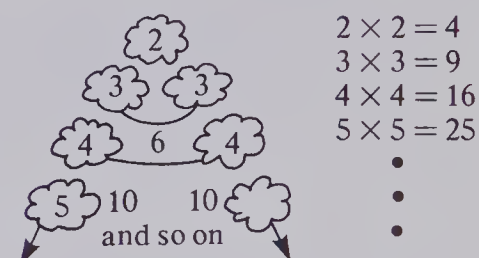
## SUGGESTIONS

**Initial Activity** Any students attempting this page should first complete page 32.

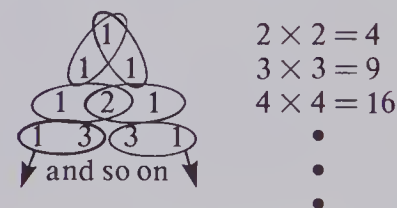
## USING THE BOOK

The first 9 triangular numbers should be obvious to most students as being 1, 3, 6, 10, ..., 45.

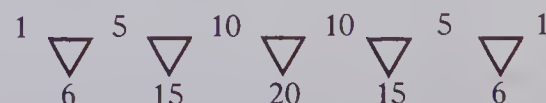
The square numbers in Exercise 2 may be a little more difficult to see:  $4 \times 4 = 16$ ,  $5 \times 5 = 25$ , and so on. The pattern of the factors forms a triangle with the upper vertex meeting at 2. Some students will note that 2 is not a square number. Encourage them to view the solution as 2 times itself or  $2 \times 2 = 4$ .



Some students may find other pairs of numbers to make square numbers.



The **CHALLENGE** in the middle of the page encourages students to look for an addition solution. Some pupils will find the relationship based on a series of inverted equilateral triangles, where the sum of the upper two vertices is equal to the lower vertex.



After students have completed rows 4 and 5 in Exercise 3, encourage them to predict the remaining sums. [Each sum is twice that of the preceding sum.] Predictions could be verified by using a calculator if one is available, or by means of paper and pencil.

## ACTIVITIES

1. Encourage those students who finish early to explore Pascal's Triangle for other number patterns. These discoveries could be presented to the rest of the class.

2. Some students may enjoy reading more about Pascal and his work. This may lead students to investigate the work of other mathematicians.



OBJECTIVE

To practise addition and subtraction of 3- and 4-digit numbers

PACING

- Level A All
- Level B All
- Level C All

RELATED AIDS

HMS — DM6.  
BFA PROB. SOLVING LAB  
II — 25-28.

USING THE BOOK

Students should understand that each section is composed of a number of partial trips. For example, Vancouver to Edmonton is composed of 3 partial trips of 438 km, 525 km, and 392 km respectively.

If you have access to mini-calculators, you might want to include their use as a checking device after the paper-and-pencil exercises have been completed. If one calculator is available, you might select a student operator to help check answers.

You may wish to provide a large wall map of Canada, thumbtacks, yarn, and appropriate distance labels to put the data from this page in better perspective.

ACTIVITIES

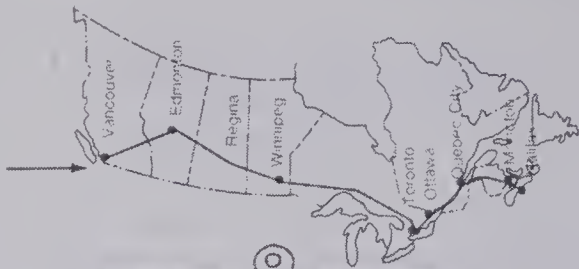
1. Some students may wish to investigate "Calendar Magic". This activity provides extra practice with addition and also encourages students to look for patterns.

Draw a calendar page and run copies through the ditto machine, or have students bring old calendars from home. Write the instructions on the chalkboard.

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

(a) Select any 4 × 4 grid that contains 16 numbers.

### Canadian Road Test



The Gord Motor Company tested a new model car by driving it across Canada. Each number shows a part of the total trip.

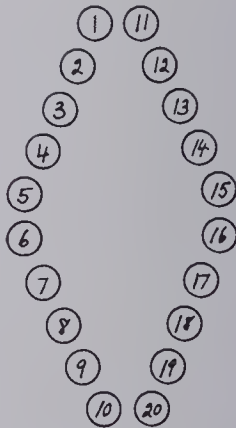
	Sections	Kilometres	
A	Vancouver	438	1355 km E
	to	525	
	Edmonton	392	
B	Edmonton	465	800 km F
	to	335	
C	Regina	285	571 km G
	to	286	
D	Winnipeg	346	2109 km H
	to	620	
	Toronto	539	
		604	

	Sections	Kilometres	
	Toronto	187	399 km
	to	212	
	Ottawa		
	Ottawa	274	441 km
	to	167	
	Quebec City		795 km
	to	316	
	Moncton	195	
	Moncton	284	262 km
	to	105	
	Halifax	157	

- Find the total distance for each section. See above.
- Find the total distance from Vancouver to Halifax. 6732 km H
- Which section is the shortest? Which section is the longest? D
- How much greater is the distance covered  
(a) in Section A than Section G? 560 km (b) in Section B than Section E? 401 km

34 Addition subtraction practice

Sample Gameboard



Materials: (i) different coloured marker for each player; (ii) ordinary die.

- Each player places his or her marker on any number.
- First player rolls the die. Every player moves his or her marker the number of spaces shown on the face of the die.
- The number on which the marker lands becomes the score for the player for that round. (For example, a marker is placed on 3 at the beginning of the game. The rolled die shows 5. The player moves the marker five spaces to the 8. The score for the first round is 8.)
- Play five rounds. The player with the greatest total score wins!

# Chapter Test

1. Complete the table.

Rule ?	
Enter	Display
14	23
2	11
25	34
17	<input type="text"/> 26
8	<input type="text"/> 17
10	<input type="text"/> 19

The rule is  $+9$

5. Write numerals for each

- (a) two hundred forty-six thousand, five hundred nineteen **246 519**  
 (b)  $70\,000 + 3000 + 500 + 20 + 4 + 0.8 + 0.09$  **73 524.89**  
 (c) twenty-one million, four hundred thousand **21 400 000**  
 (d) 5 tens, 2 ones, 6 tenths, 4 hundredths, 7 thousandths **52.647**

6. Add

- (a)  $\begin{array}{r} 283 \\ 409 \\ +287 \\ \hline 979 \end{array}$  (b)  $\begin{array}{r} 13\,216 \\ 180 \\ 22\,406 \\ +73 \\ \hline 35\,815 \end{array}$  (c)  $\begin{array}{r} 702.44 \\ +368.09 \\ \hline 1070.53 \end{array}$  (d)  $\begin{array}{r} 4172.83 \\ +3608.42 \\ \hline 7781.25 \end{array}$

7. Subtract.

- (a)  $\begin{array}{r} 625 \\ -278 \\ \hline 347 \end{array}$  (b)  $\begin{array}{r} 4030 \\ -1574 \\ \hline 2456 \end{array}$  (c)  $\begin{array}{r} 702.43 \\ -317.05 \\ \hline 385.38 \end{array}$  (d)  $\begin{array}{r} 5624.00 \\ -1781.42 \\ \hline 3842.58 \end{array}$

8. Compare. Use  $<$ ,  $>$ , or  $=$

- (a)  $246 \bullet 358$  (b)  $4627.8 \bullet 4627.5$  (c)  $327.94 \bullet 327.91$

9. Write in our numerals:

- (a) xxiv **24** (b) MDCXIV **1614** (c) CD **400**

10. Write in Roman numerals:

- (a) 54 **LIV** (b) 615 **DCXV** (c) 1982 **MCMLXXXII**

Chapter 1 test 35

## OBJECTIVE

To evaluate achievement of the chapter objectives

## PACING

Level A All  
 Level B All  
 Level C All

## RELATED AIDS

HMS — DM7.

## USING THE BOOK

Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a large number of students had difficulty with a particular topic or concept.

The following chart will help in this regard. The specific objectives are listed in the Chapter Overview.

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1	A	1, 2
2	B	27, 28
3, 4, 5	C	10, 14, 15, 20, 22-25
6	D	6, 7, 12, 16, 21
7	E	12, 16, 21
8	F	17
9, 10	G	30, 31

# CHAPTER 2 OVERVIEW

This chapter formalizes the discussion of the geometric shapes which were introduced in earlier books. A non-standard unit approach is used to angle measure, and then formalized in actual use of the protractor. The concept of circles is reviewed in light of angle measure. Congruence is reinforced through a discussion of corresponding parts of congruent shapes in slides, flips, and turns. Parallel lines and parallelograms are introduced. The drawing of shapes is also highlighted.

Interspersed is practice in problem solving including multiple-step problems and the use of diagrams and approximations to help solve problems.

## OBJECTIVES

- A To draw common 3D shapes, parallel lines, and parallelograms
- B To name and classify angles
- C To measure and identify congruent angles
- D To identify congruent shapes and to name corresponding parts of congruent shapes
- E To solve multi-step problems including the use of diagrams and approximations to help solve these problems

## MATERIALS

protractor  
geo-boards  
dot paper (HMS — DM13)

plastic transparent mirrors  
drinking straws  
pipe cleaners  
rulers  
3D models  
overhead projector  
compasses  
cardboard for models

## CAREER AWARENESS

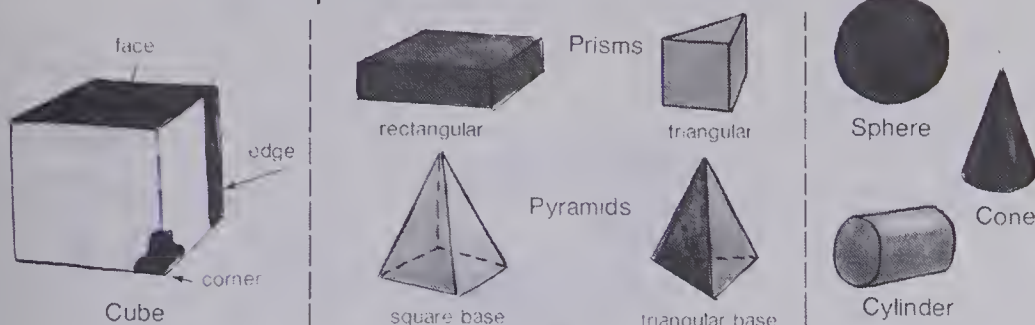
### Concession Operator [62]

Concession operators (both full- and part-time) provide a vital service which allows the public to more fully enjoy entertainment and relaxation. The operators must forecast needs in order to meet the demands of their clients. On the basis of the age of the crowd, the time of day and nature of the event, the weather, and the expected attendance, the operators must decide how many and what sort of supplies to order: hamburgers, hot dogs, cans of soft drinks, ice cream, popcorn, candy, etc.

The owners also have costs which must be covered: licences, permits, rent, equipment, wages, and losses. Since many concession stands do not operate every day, some concessions are operated as side-line businesses. In other situations, the business is a full-time operation.

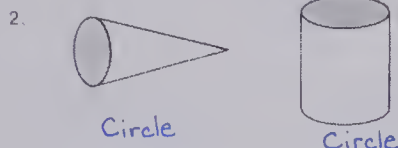
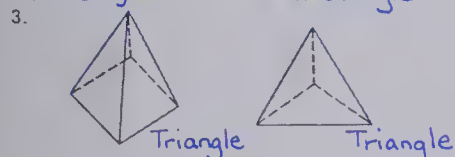
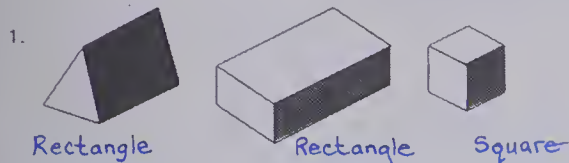


## Shapes and Their Faces



### Exercises

Name the shape of each coloured face



4. How many edges, faces, and corners are there on each solid?

Copy and complete the chart

Shape	Edges	Faces	Corners
Cube	12	6	8
Rectangular prism	12	6	8
Triangular prism	9	5	6
Square-base pyramid	8	5	5
Triangular base pyramid	6	4	4

## BRAINTICKLER

Name the shape.

I roll.

I have no corners.

I have no faces.

Who am I? Sphere

Edges, faces, and corners of solids 37

## OBJECTIVE

To name 3D shapes and the faces of the shapes

## PACING

Level A All

Level B All

Level C All

## VOCABULARY

prism, pyramid, sphere, cylinder, cone, triangular, rectangular

## MATERIALS

models of the 3D shapes illustrated in the student's text

## RELATED AIDS

HMS — DM8, DM9, and DM10.

## BACKGROUND

Polygons are plane (flat) geometric shapes with straight sides. Geometric shapes, such as prisms and cylinders, are not flat shapes. They are examples of solids. Solids with flat faces are called polyhedra. Some solids have flat surfaces (faces), while others do not.

## SUGGESTIONS

**Initial Activity** Introduce the shapes to the class by holding up one at a time and discussing it. Ask such questions as: "What is an edge? corner? face?" "What is the shape of this face?" "How many faces does this shape have?" (Use chalk to mark each face.) "How many edges? corners?" "What is its name?"

## USING THE BOOK

After the Initial Activity, most students will be able to do the exercises without difficulty. If you feel your students are ready, you may wish to introduce the words "vertex" and "vertices" for "corner(s)".

## ACTIVITIES

1. Prepare copies of the nets to make all the solids except the sphere (HMS — DM8 to DM10, plus a net for a cube).

Have students cut out and make the models. Attach the name to each (make sure the name is large enough to be read from a distance), and suspend a suitable collection from the ceiling. To represent a sphere, use a balloon (make certain it's spherical) or a styrofoam sphere.

2. Ask the students to prepare a

bulletin-board display of shapes in our everyday lives. The display is to show pictures of the shapes as found in objects in the world. The shape being illustrated should be named, and if necessary, outlined with a felt pen.

3. Provide each student with a library-size card. Ask each student to write a riddle similar to that in the Braintickler. Each writes the riddle on the card with the solution on the back. These cards may be placed in the Math Corner for students to use in their spare time.

## OBJECTIVES

To make skeleton models of cubes and rectangular prisms  
To sketch the models

## PACING

Level A Page 38 — All; Page 39 — 1-3  
Level B All  
Level C All

## MATERIALS

straws and pipe cleaners, projector, large paper, tape

## RELATED AIDS

HMS — DM11.

## BACKGROUND

Many students (and adults) do not realize why solids are drawn the way they are. Also, we tend to always draw certain solids the same way, thereby restricting development of spatial perceptions. The activities suggested here will assist the student in visualizing 3D shapes.

## USING THE BOOK

Provide the students, individually or in pairs, with the materials needed to make the skeleton models. Some students may find it easier to use straws and marshmallows, or toothpicks and bits of Plasticine, than the straws and pipe cleaners. However, the models made should be large enough to use in the shadow work.

For the shadow work (Exercise 3, page 38 and Exercise 1, page 39), have the students work in pairs. One student holds the model on top of his or her head to keep the model still while casting the shadow on the wall. The partner then traces the shadow as quickly as possible. The students' models, while perhaps crude, will give meaning to the other exercises.

In Exercise 4, page 38, and Exercise 2, page 39, present the steps formally while the students do them at their desks. Some students will need these steps repeated several times. You may wish to point out that the dotted lines in Step 4 on page 38 were introduced to indicate what would be the unseen edges if the shape were actually solid. This changing to dotted lines is not necessary on the part of the students.

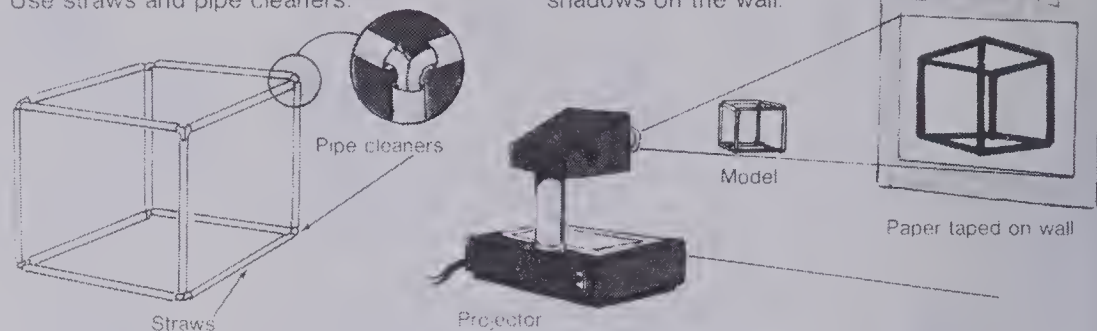
Bring a variety of rectangular boxes to class. Discuss these in turn by contrasting, for example, a tall, thin box with a shallow, wide one.

## Models and Their Shadows

Work In Pairs

Make a model of a cube.  
Use straws and pipe cleaners.

Use your model to make shadows on the wall.



### Exercises

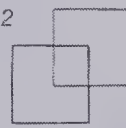
1. How many straws are necessary to make the cube?
2. How many pipe cleaners are necessary to make the circled corner? 12
3. Make 3 different shadows with your model.  
Trace or draw the shadows.  
What kind of shape is shown by each of your shadows? 1

4. Follow these steps to draw a cube.

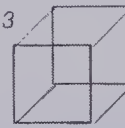
Step 1



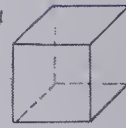
Step 2



Step 3

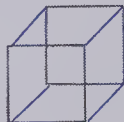


Step 4

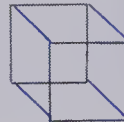


5. Trace and complete each cube.

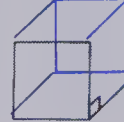
(a)



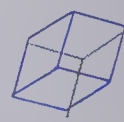
(b)



(c)

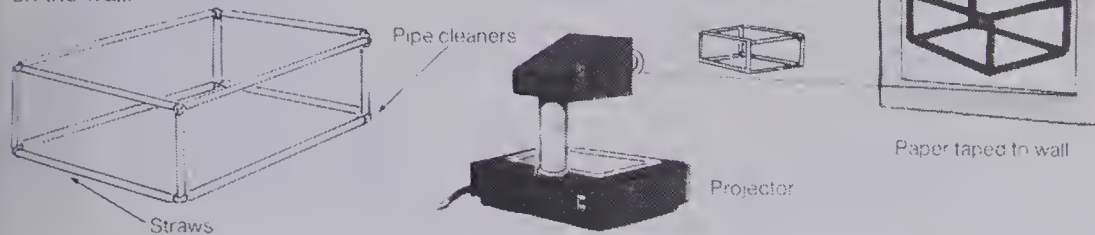


(d)



# Drawing Rectangular Prisms

Make a model of a rectangular prism  
Use your model to make a shadow  
on the wall.

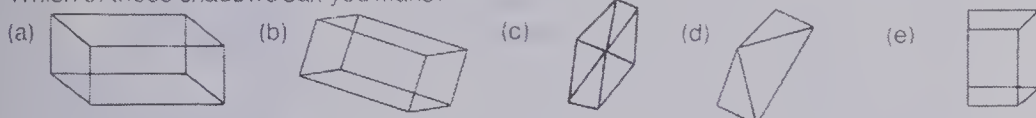


## Exercises

1. Make a model of a rectangular prism.

Use it to make shadows.

Which of these shadows can you make?

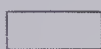


2. Follow these steps to draw a rectangular prism

Step 1



Step 2



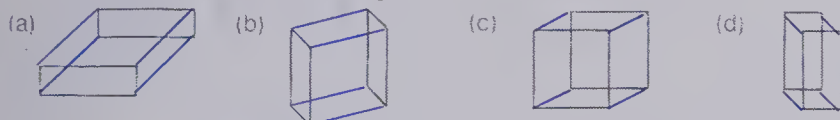
Step 3



Step 4



3. Trace and complete each rectangular prism.



4. Describe each box you drew using such words as tall, short, thin, thick, long, wide, deep, shallow.

5. Draw a tall, thin box

6. Draw a shallow, long box

- ★ 7. Draw a shallow, wide, long box

- ★ 8. Draw a tall, narrow, long box.

Drawing rectangular prisms 39

## ACTIVITIES

1. Have the students make different shadows with their models. Then ask them to draw, without tracing if possible, each shadow.

2. Have students bring boxes for a collection. Each should be labelled with two or three descriptive words such as "tall, thin, and long".

3. Provide students with various rectangular prisms: cornflakes box, chalk box, and so on. Ask them to draw each one.

## EXTRA PRACTICE

1. Compute the quotients and remainders. Answers are given in square brackets.

[88 R1]

[81 R4]

$$(a) 3 \overline{)265}$$

$$(b) 5 \overline{)409}$$

[99 R3]

[64 R6]

$$(c) 4 \overline{)399}$$

$$(d) 7 \overline{)454}$$

[23 R2]

[35 R5]

$$(e) 6 \overline{)140}$$

$$(f) 7 \overline{)250}$$

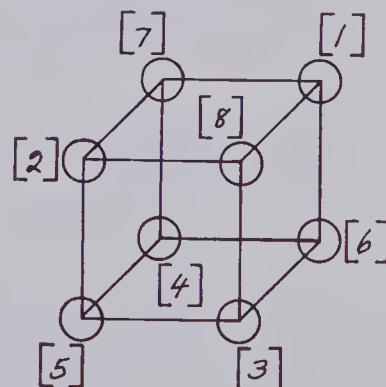
[46 R7]

[55 R8]

$$(g) 8 \overline{)375}$$

$$(h) 9 \overline{)503}$$

2. Draw this cube and place circles at each corner. Write the remainders from Extra Practice Exercise 1 on small pieces of paper. Then put these pieces of paper on the 8 circles so that the numbers at the four corners of any face has a sum of 18.





OBJECTIVE

To solve problems involving more than 1 step

PACING

- Level A 1-4
- Level B All
- Level C All

BACKGROUND

Word problems involving more than 1 step are formally introduced. Except for Exercise 3, each problem is structured in a similar way: (■ × ■) + ■. While this is only one of the many types the student will encounter, this page is designed to get students away from the view that one operation provides the answer.

For further notes on problem solving, see the Background section in the Chapter Overview notes at the beginning of Chapter 1.

SUGGESTIONS

**Initial Activity** Review the steps involved in solving 1-step word problems by orally completing a word problem such as the following.

**Example**  
26 horses are grazing in a field.  
17 of them are black. The others are brown.


How many brown horses are there?  
Be sure to clearly show the relationship between the given facts and the parts of the appropriate number sentence.


26        17        9  
horses    black    other  
altogether   horses   horses


If necessary, repeat with another example before having the students open their books.


USING THE BOOK

Take the students through the display by asking a student to read the problem. You might wish to demonstrate the problem pictorially on the chalkboard to illustrate where the number sentences come from.

  
Horse 1

  
Horse 2

  
Horse 3

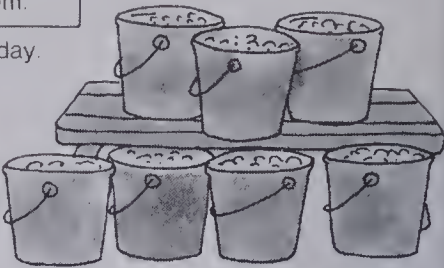
$3 \times 2 = 6$   
and  
  
Colt  
 $6 + 1 = 7$

Horses

Sometimes it takes more than one step to solve a problem.

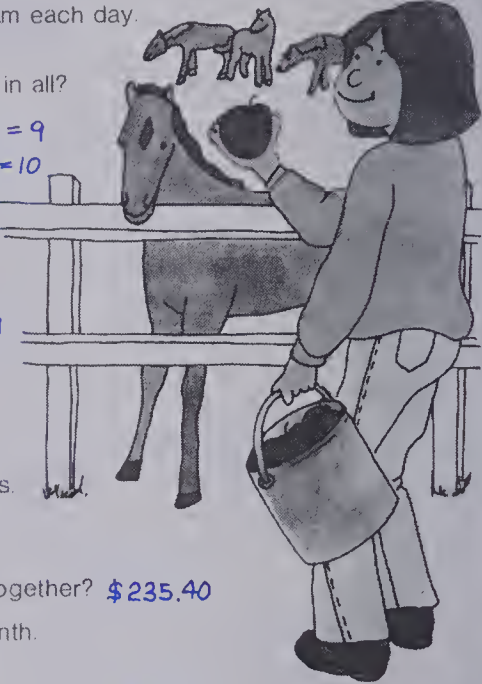
Jackie feeds each of three horses two pails of oats each day. She also feeds a colt one pail of oats each day. How many pails of oats does she feed to all of the horses each day?

- Step 1.    pails for big horses:                       $2 \times 3 = 6$   
Step 2.    pails for big horses and colt:     $6 + 1 = 7$   
Sentence: She feeds the horses 7 pails of oats each day.



Exercises

- Jackie exercised each of the 3 big horses for 3 km each day. She exercised the colt for 1 km.  
How many kilometres were the horses exercised in all?  
Step 1.    kilometres for big horses:     $3 \times 3 = 9$   
Step 2.    kilometres for all horses:     $9 + 1 = 10$   
Sentence: *The horses were exercised 10 km in all.*
- Each of the big horses has a mass of 600 kg. The colt has a mass of 300 kg.  
What is the total mass of the 4 horses? *2100 kg*
- Jackie bought three dozen apples for her horses. She fed 16 to the horses.  
How many apples does she have left? *20*
- Jackie bought a saddle and 6 pairs of horseshoes. The saddle cost \$200. Each pair of horseshoes cost \$5.90.  
How much did the saddle and horseshoes cost together? *\$235.40*
- The cost of boarding the big horses is \$85 a month. It costs \$50 a month for the colt.  
How much a month does it cost to board the four horses? *\$305*



40 Problems more than 1 step

- Ask:
- How many pails of oats are needed for the 3 horses? [ $2 \times 3$ ]
  - How many more does Jackie need for the colt? [1]
  - How many pails are needed altogether? [7]
- Identify clearly what you want the students to show in their solutions. You may wish to have them show one additional statement. For example,
- |                       |       |
|-----------------------|-------|
| Number for big horses | _____ |
| Number for colt       | _____ |
| Total number          | _____ |
| Sentence              |       |

Have students put their full solutions on the chalkboard for correction purposes.

ACTIVITIES

- Prepare some 2-step, fairly simple word problems on cards. (An old arithmetic text is often an ideal “cut and paste” source.) Have the students sort these cards into containers (boxes or envelopes) which are appropriately labelled: add, subtract; multiply, add; multiply, subtract; etc.

The task here is not necessarily to solve problems but to choose the correct operations in the correct order. Have the containers checked by a second student who reports on the progress of the first and reshuffles the cards for the next pair of students.

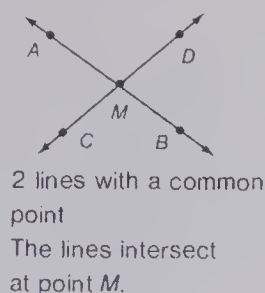
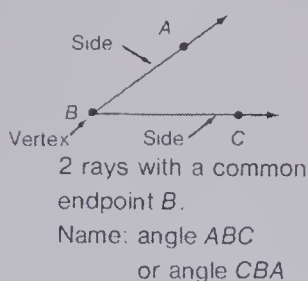
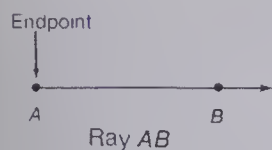
- Ask some students to illustrate the solution of word problems as exemplified in Using the Book. When their pictures are complete, have them explain to small groups how their picture shows the solution to the 2-step problem.

EXTRA PRACTICE

- Jackie brushes the horses every day. The 3 big horses take about 15 min each to brush. The colt takes about 10 min. How many minutes does it take to brush all 4 horses?
- Jackie feeds carrots to the horses each day. She gives 3 to each of the big horses and 2 to the colt. How many carrots should she bring each day?

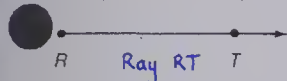
(Continued on page 43)

## Angles



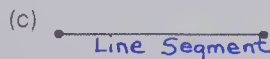
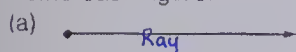
### Exercises

The endpoint of a ray is named first. Name each ray.

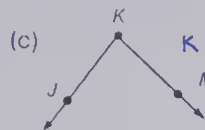
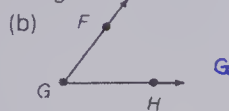
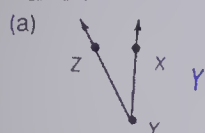


4. Draw.  
(a) a ray (b) an angle CDE (c) two intersecting lines (d) a line

5. Name each figure.

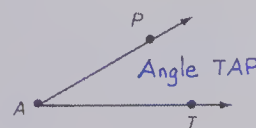


6. Name the vertex of each angle.

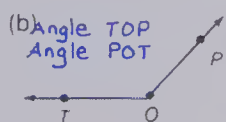
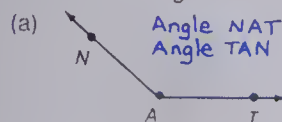


7. Name the rays or sides of each angle in Exercise 6.

8. One name for this angle is angle PAT. Write another name.



9. Name each angle two ways.



Naming angles 41

### ANSWERS:

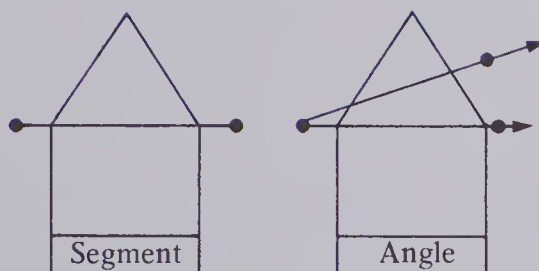
7. (a) Ray YZ; Ray YX (b) Ray GF; Ray GH (c) Ray KJ; Ray KM (d) Ray WP; Ray WV

## ACTIVITIES

1. Have the students copy these 3 points.

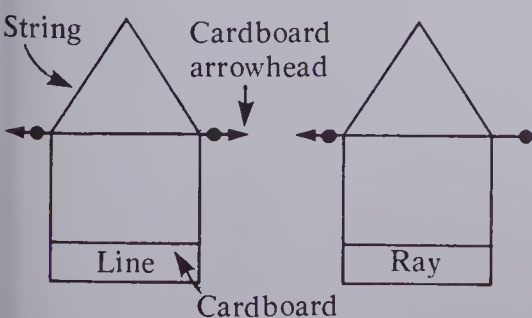
Ask, "How many line segments can you draw, each having 2 of these as endpoints?" [3] Repeat for 4 points. [6] 5 points. [10]

2. Ask students to work in groups to make models of lines, rays, segments, and angles using wire (cut from coat hangers) and 4 cm styrofoam balls (or Plasticine) as shown. Label and suspend the models from the ceiling.



## EXTRA PRACTICE

- Provide each student with a sheet which shows 10 to 15 unlabelled angles. Have them
  - label each point
  - name 5 sides
  - name 5 vertices
  - name 5 angles in 2 ways.
- How many endpoints does each have?
  - line
  - ray
  - segment



## OBJECTIVES

To identify lines, segments, and rays  
To name angles

## PACING

Level A 1-8

Level B All

Level C All

## VOCABULARY

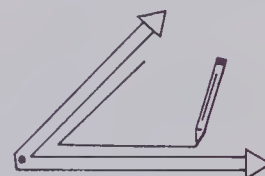
ray, vertex (singular), intersect, line, segment

## BACKGROUND

A line is undefined but we develop the idea that it is unending in both directions. A ray is comprised of an endpoint and part of a line which goes on indefinitely in one direction. A segment is a portion of a line and it has two endpoints. An angle is formed by two rays with a common endpoint.

## SUGGESTIONS

**Initial Activity** Discuss lines, rays, and segments but without formal definitions. Use drawings and ask students to draw representations of each on the chalkboard.



Have each student make two rays, joined at the endpoint with a fastener which allows the rays to rotate. The students can trace the angles they make. Discuss how the angles are named.

## USING THE BOOK

Draw a line on the chalkboard.



Discuss the salient features and its name. [It goes on and on in both directions and it is called a line.] Then erase the left side to form a ray.



Discuss. [It goes on and on in one direction only. It has one endpoint.] Erase the right end and discuss a segment.



You may wish to do this page with the class under close supervision. Exercises 1 to 3 and 5 to 9 may be done orally.



## OBJECTIVES

- To draw a circle using compasses when the radius is given
- To measure the radius and diameter of circles

## PACING

- Level A 1-15
- Level B 1-15
- Level C All

## VOCABULARY

radius, diameter

## MATERIALS

compasses for each student, ruler

## BACKGROUND

A circle is the set of all points (in a plane) that are equidistant from a particular point (centre). A line segment with one end on the circle and the other on the centre is a radius. A line segment through the centre and with both endpoints on the circle is a special chord called a diameter. A chord is any segment with endpoints on the circle.

## SUGGESTIONS

**Initial Activity** Review the procedure involved in using compasses to draw circles. Emphasize that (a) the pencil point and compasses point should almost touch when compasses are closed as a guide to pencil placement; (b) the top handle of the compasses fits nicely between the thumb and index finger while drawing the circle; (c) a cleaner, neater circle can be made with a light touch, repeatedly twirling the compasses and retracing the circle in order to darken the circumference.

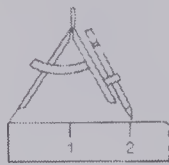
Provide plenty of scrap paper and time in order for the pupils to refine their skills.

## USING THE BOOK

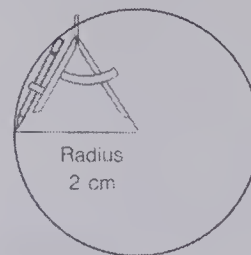
Using a wheel such as that on a bicycle, ask individual students to measure the distance from the centre of the wheel to its edges in centimetres. In addition to receiving measuring practice, the students will realize that the centre is the same distance from any point on the wheel.

Then ask the students to measure the distance from one edge of the wheel to another, passing over the centre. Ask them how this distance relates to the distance from the centre of the circle to the edge. While making these measurements use the terms radius, radii, and diameter.

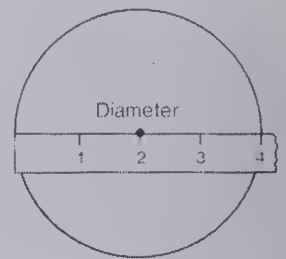
## The Circle



Open compasses to 2 cm.



Draw circle.

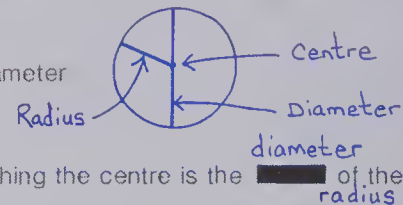


Place ruler across circle touching centre.

### Exercises

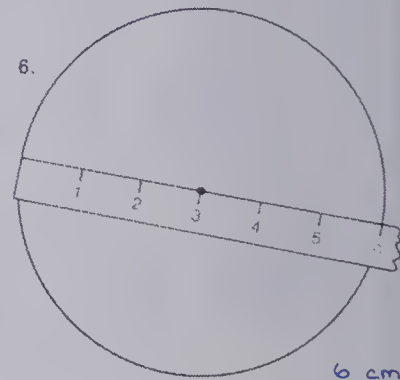
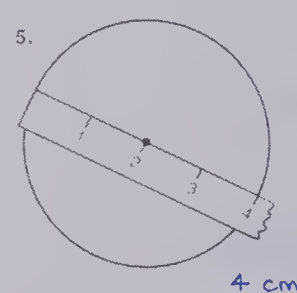
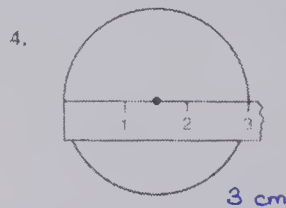
- Use compasses to draw a circle. Mark and label: centre, radius, diameter

Copy and complete.



- The distance across a circle touching the centre is the **diameter** of the circle.
- The distance from the centre to the edge of the circle is the **radius**.

What is the measure in centimetres of these diameters?



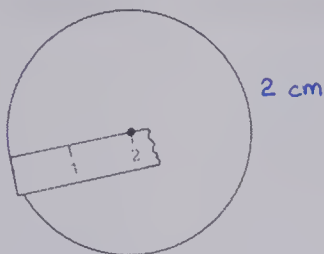


What is the measure in centimetres of each radius?

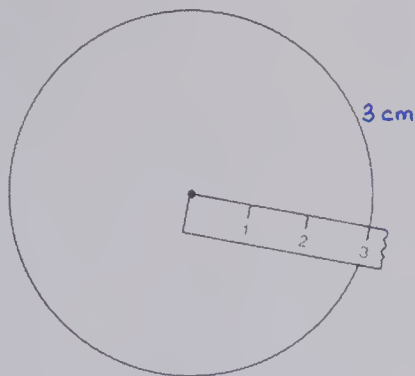
7.



8.



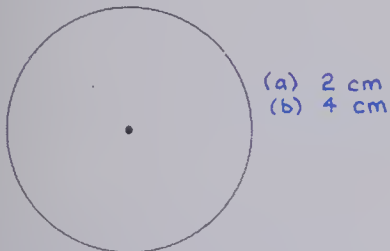
9.



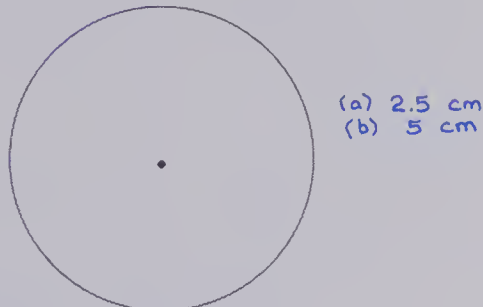
Use a ruler to find the measure of

- (a) the radius of each (b) the diameter of each.

10.



11.



12. The measure of radius  $AO$  is 1 cm.

What is the length of radius  $OB$ ? 1 cm

What is the length of the diameter  $AB$ ? 2 cm

13. The measure of radius  $RO$  is 2 cm

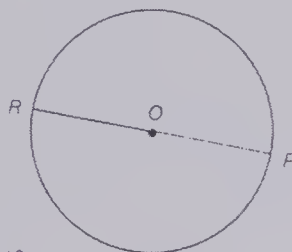
What is the measure of radius  $OP$ ? 2 cm

What is the length of the diameter  $RP$ ? 4 cm



14. Use the method shown to draw a circle with a radius of

(a) 2 cm (b) 3 cm (c) 4 cm.



15. What is the diameter of each circle you drew in Exercise 14?

(a) 4 cm (b) 6 cm (c) 8 cm

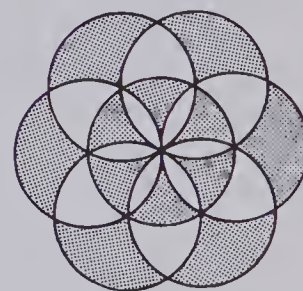
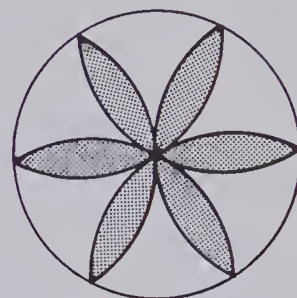
- ★16. What is the relationship between the lengths of the radius and the diameter of a circle?

The diameter is twice the radius.

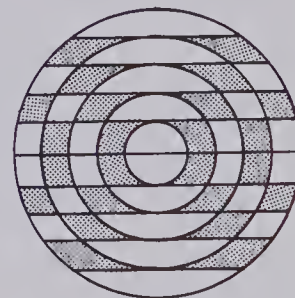
Discuss the answers to Exercises 12 and 13 to reinforce that "the diameter is twice the radius".

## ACTIVITIES

1. Ask the students to draw patterns. Keep the patterns simple. You may need to give step-by-step assistance. Colour the patterns.



2. Draw a series of circles which all have the same centre but different radii.



(Continued from page 40)

3. Jackie keeps the horses in a square field.

It has a white fence around it.

There is a fence post at each corner.

There are also 8 posts along each side.

How many posts are there around the field altogether?

4. The stalls in the barn for each horse take 2 bales of fresh straw to cover the floor.

There are 46 bales of straw stacked outside the barn.

How many will be left when all 4 stalls are cleaned?

## OBJECTIVES

- To relate angle measure to the amount of rotation of a ray
- To use nonstandard units to measure the size of an angle
- To draw an angle with a given measure stated in the nonstandard unit used

## PACING

- Level A All
- Level B All
- Level C All

## VOCABULARY

rotation

## MATERIALS

duplicated circles about 4 or 5 cm in radius — these should be on heavy paper and marked in  $30^\circ$  intervals for students to cut up for unit angles (DM12)

one large set of demonstration, unit angles for chalkboard or flannel board (Have the students help you make these.)

## RELATED AIDS

HMS — DM12.

## BACKGROUND

The degree ( $^\circ$ ) is an arbitrarily chosen unit for angle measure. Here we use a nonstandard unit to prepare students for use of the standard unit at a later time. There is no need to introduce the degree at this time.

## SUGGESTIONS

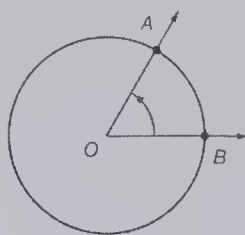
**Initial Activities** Use a pair of moveable rays as described in the Initial Activity for page 41 to illustrate the rotation of rays to form different angles. Place both rays at the 03:00 position and turn one counterclockwise. You might discuss one-quarter turns, one-half turns, three-quarter turns, and full turns. Then repeat by starting with both hands at the 09:00 position and turn one hand clockwise for different rotations.

Be certain to identify the vertex and rays of the demonstration angle.

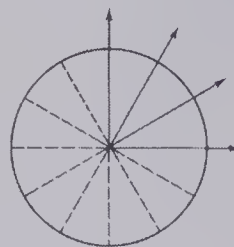
## USING THE BOOK

Read through the instructions in the display at the top of the pupil page for making unit angles, or provide marked circles as indicated under Materials to simplify the task. Have the pupils use the cut-out angles to complete the exercises on pages 44 and 45.

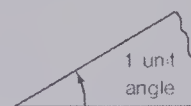
## Measuring Angles



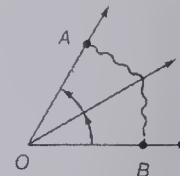
The size of an angle is measured by the amount of rotation of one ray from the first ray.



We will use one of these parts as a unit of measure.



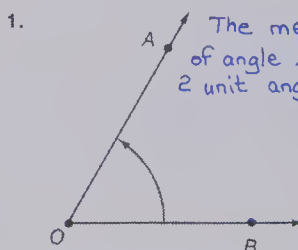
Copy and make 6 of these unit angles.



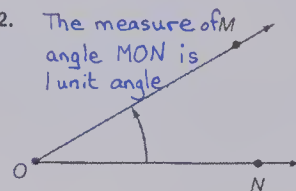
The measure of angle AOB is 2 unit angles.

### Exercises

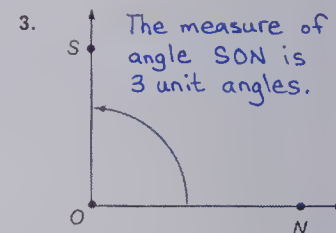
Place the unit angles you made on each angle to find its measure. Write a statement.



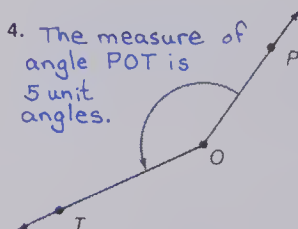
The measure of angle AOB is 2 unit angles.



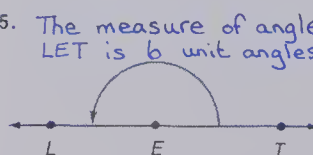
The measure of angle MON is 1 unit angle.



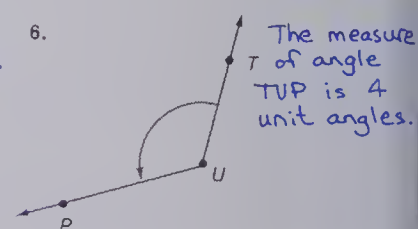
The measure of angle SON is 3 unit angles.



The measure of angle POT is 5 unit angles.

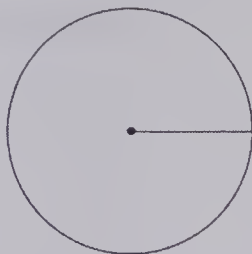


The measure of angle LET is 6 unit angles.

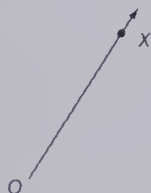


The measure of angle TUP is 4 unit angles.

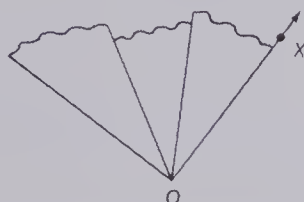
7. How many unit angles fit in a circle? 12



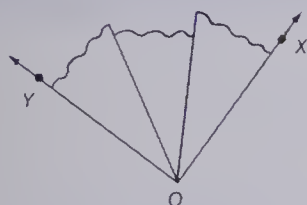
8. Follow these steps to draw an angle with a measure of 3 units.



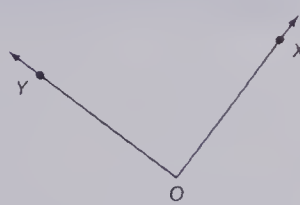
Draw and name a ray.



Place 3 unit angles on ray



Draw second ray and name.



Angle XOY has a measure of 3 units.

9. Draw and name an angle with a measure of

- (a) 2 units (b) 6 units  
(c) 5 units (d) 4 units

10. What is the name of the angle with a measure of 3 units? Right angle

Ask the students to place their unit angles on angle  $AOB$  (Exercise 1). How many are needed? [2] "This measure of angle  $AOB$  is 2 units." Repeat for Exercises 2 to 7.

Go through the steps in Exercise 8 thoroughly. Some students may require assistance with Exercise 9. Don't expect too much here since it is difficult to hold the unit angles in place, but do emphasize the idea of drawing angles of certain measures.

## ACTIVITIES

1. Assign the students to work in pairs. Have one student identify an angle in the classroom and the second use the unit angles (demonstration-size, unit angles) to measure the angle. The students should take turns in each role.

2. Use the model angle students made for page 41. The students open the two rays to form an angle. Then they place the unit angles (DM12) in the angle to determine if the angle measure is about 1 unit, 2 units, 3 units, etc. Emphasize that the more the ray rotates, the larger the angle, i.e., the larger the measure of the angle.

3. Make angles on the chalkboard (or flannel board). Let the students use the demonstration, unit angles to measure the angles.



## OBJECTIVE

To identify congruent angles by

- matching
- measuring (using the nonstandard unit)

## PACING

- Level A All  
Level B All  
Level C All

## VOCABULARY

congruent

## MATERIALS

tracing paper, unit angles from page 44

## BACKGROUND

Two figures are congruent if they are the same size and shape. Hence, two angles are congruent if they are the same size, i.e., if their measures are the same. Students may prefer to say that the angles are equal. Accept this but you should set the example by using the word "congruent".

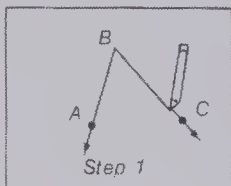
## USING THE BOOK

Two ways to decide whether or not angles are congruent are illustrated in the pupil display. Discuss each way: (a) tracing and matching, (b) measuring.

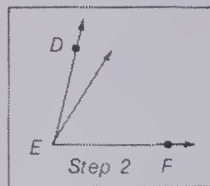
Emphasize that the measure of an angle is determined by the amount of rotation (number of unit angles) and *not* by the length of the rays. Exercise 9 may be used to assess students' understanding of this concept. To bring out this point, use a student's unit angle (small, desk size) and a demonstration, unit angle (large cardboard as described in the Materials section of pages 44 and 45). Ask if these angles are congruent. [yes]

## Congruent Angles

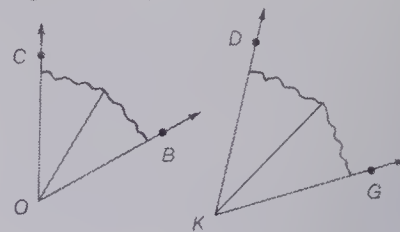
Two methods of identifying congruent angles



Angle ABC is not congruent to angle DEF.



- Trace one angle.
- Place tracing over the second angle.
- If the two match, the angles are congruent.

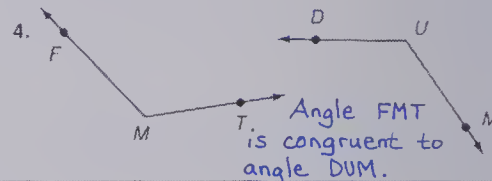
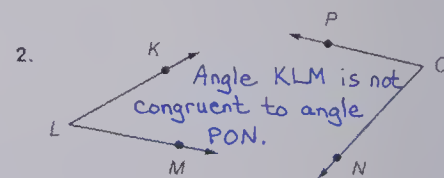
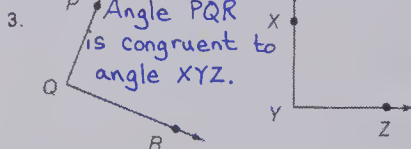
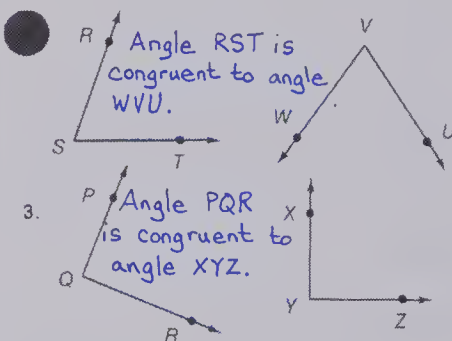


- Use unit measures to find the size of each angle.
- If measures are the same the angles are congruent.

Congruent angles have the same measure.

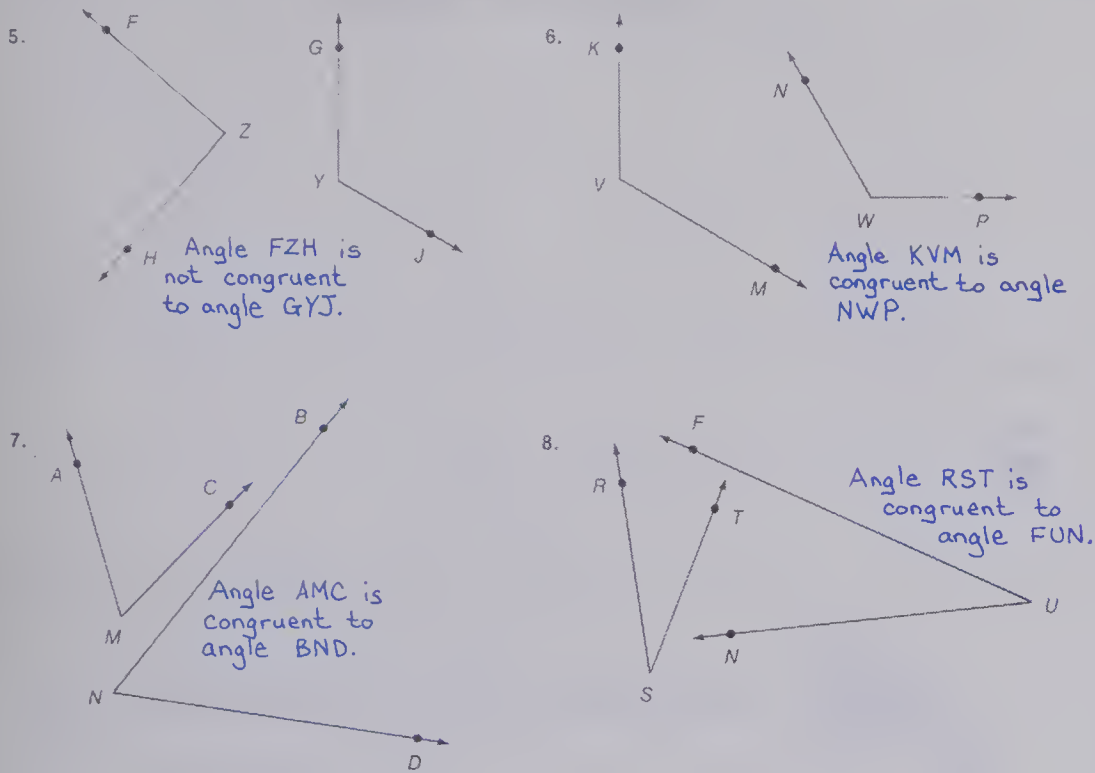
### Exercises

Are the angles congruent? Use the tracing method. Write a statement



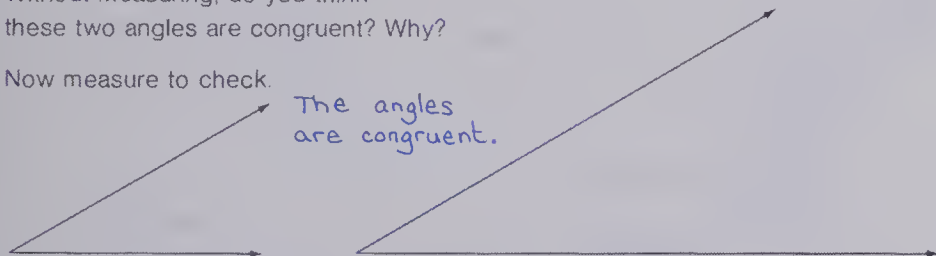
May 7

Are the angles congruent? Use the measuring method. Write a statement.



9. Without measuring, do you think these two angles are congruent? Why?

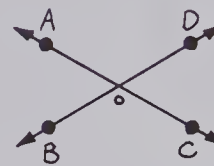
Now measure to check.



Congruent angles 47

## ACTIVITIES

1. Make copies of this figure ( $\angle AOB = 60^\circ$ ).

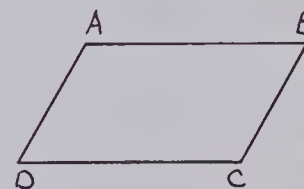


Ask the students to measure each angle using their unit angles. What do they notice about

- (a)  $\angle AOB$  and  $\angle DOC$ ?  
(b)  $\angle AOD$  and  $\angle BOC$ ?

[Each pair is congruent.]

2. Make copies of this figure. (A parallelogram with  $\angle A = 120^\circ$  and  $\angle B = 60^\circ$ .)



Repeat the instructions for Activity 1 and ask about the relation between

- (a)  $\angle A$  and  $\angle C$ .  
(b)  $\angle D$  and  $\angle B$ .

[Each pair is congruent.]

3. Have students work in pairs. One student draws an angle and the other uses the unit angle to measure it. Since the angles may not be multiples of the unit angle, the student may need to reply in this manner: "It is more than 2 but less than 3 unit angles." "It is closer to 2 than to 3." Try to bring out the need for a smaller unit of measure.

## OBJECTIVES

To identify and name acute, right, and obtuse angles  
To draw acute, right, and obtuse angles

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

acute, obtuse

## MATERIALS

unit angles made for page 44

## RELATED AIDS

HMS — DM12.

## BACKGROUND

An acute angle has a measure greater than  $0^\circ$  and less than  $90^\circ$ . A right angle has a measure of exactly  $90^\circ$ . An obtuse angle has a measure greater than  $90^\circ$  and less than  $180^\circ$ . A straight angle has a measure of exactly  $180^\circ$ . A reflex angle has a measure greater than  $180^\circ$  and less than  $360^\circ$ .

## SUGGESTIONS

**Initial Activity** Have students stand and make these angles using their arms.



Right angle



Acute angle



Obtuse angle



Straight angle

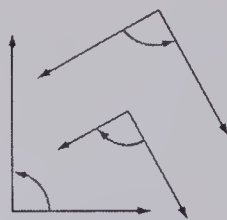
Discuss which angle is the smallest, the largest, and so on. Then place the angles in order of size.

## USING THE BOOK

The right angle is shown first since the acute and obtuse angles are related to it. An acute angle is smaller — its measure is less — than a right angle, while an obtuse angle is greater than a right angle.

Follow the instructions in the exercises and emphasize the relations of the measures.

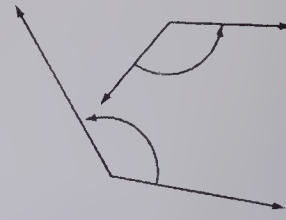
## Types of Angles



Right angles



Acute angles

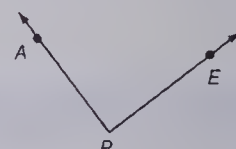
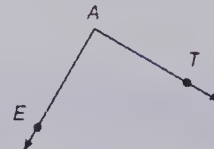


Obtuse angles

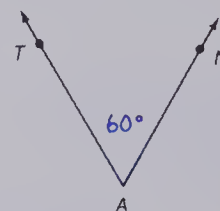
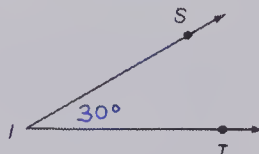
### Exercises

Use your unit angles.

1. What is the measure of each right angle?  $90^\circ$



2. What is the measure of each acute angle? Are the measures less or more than that of a right angle? *Less*



3. Find examples in your classroom of:

(a) right angles

(b) acute angles

(c) obtuse angles.

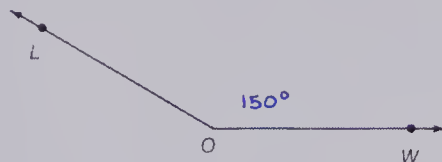
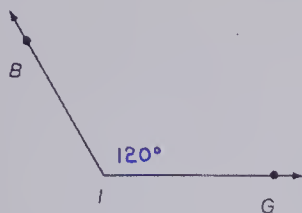
Which angle was easiest to find? *Right angle*



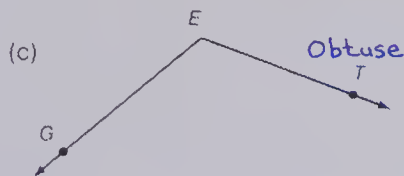
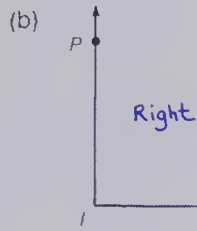
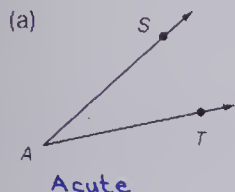
4. What is the measure of each obtuse angle?

How does the measure of each compare to the measure of a right angle? an acute angle?

more more



5. Name the type of each angle.



6. Write these two headings in your workbook.

an obtuse angle  
(a), (d)

an acute angle  
(b), (c), (e)

Now write each of these statements under the correct heading:

- (a) an angle greater than a right angle.
- (b) an angle less than a right angle.
- (c) the corner of a coat hanger.
- (d) the angle of a hockey stick
- (e) the hands of a clock at 11:00.

7. Draw

- (a) a right angle.
- (b) two different acute angles.
- (c) two different obtuse angles



Types of angles 49

- (a) The measures of acute angles are less than the measures of right angles.
- (b) The measures of obtuse angles are greater than the measurement of right angles.

For Exercise 5, emphasize that the instruction asks for the *type* of each angle, not the name of each.

## ACTIVITIES

1. Group students in pairs. Provide each pair with a geo-board and elastics. Ask one student of each pair to make a right angle. The partner is to check the work. The partner constructs the next angle named by the teacher. This continues for all the angles. The students may be asked to measure each angle when there is doubt.

2. Ask the students to report on the use of semaphore. Which letters are shown by acute angles, right angles, and obtuse angles? (You might introduce straight angles with students ready for extension.)

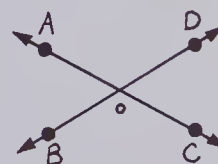
3. Ask the students to copy and complete each of these.

- (a) A right angle has a measure of \_\_\_\_\_ unit angles.
- (b) An acute angle has a measure of less than \_\_\_\_\_ unit angles.
- (c) An obtuse angle has a measure of more than \_\_\_\_\_ unit angles but less than \_\_\_\_\_ unit angles.

## EXTRA PRACTICE

1. Make copies of this figure. (Same as in Activity 1, pages 46 to 47.)

$$\angle AOB = 60^\circ$$



Ask the students to name

- (a) the acute angles
- (b) the obtuse angles.

2. Draw 10 different angles, each on a separate piece of paper. Draw some of each kind and mix them up. Give them to a classmate to sort.

## OBJECTIVE

To measure an angle in the standard unit, (degree  $^{\circ}$ ), using a protractor

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

protractor, degree

## MATERIALS

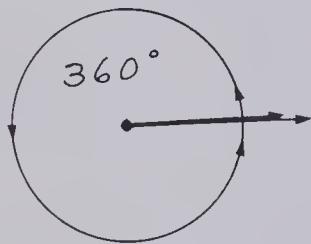
student and display protractors

## RELATED AIDS

HMS — DM12.

## BACKGROUND

The degree ( $^{\circ}$ ) is a standard unit of angle measure. There are  $360^{\circ}$  in one full rotation of one arm (ray) of an angle (that is, in a circle). The protractor shown in the student's text is graduated by tens in a counterclockwise, single scale. A quarter of a turn, a right angle, has a measure of  $90^{\circ}$ .



## SUGGESTIONS

**Initial Activity** Use the angle model from page 41. Superimpose it on the model protractor. (This works especially well on an overhead projector using a transparent protractor and angle model.) Show how the measure of the angle increases as one arm (ray) rotates and the other remains fixed. Count the measure off as you rotate the arm:  $10^{\circ}$ ,  $20^{\circ}$ ,  $30^{\circ}$ , etc.

Have students come to the projector to show angles of various measures.

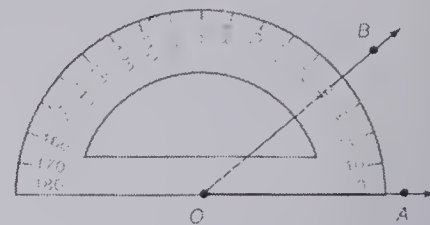
## USING THE BOOK

Discuss the display and Exercise 1 carefully. Emphasize the three steps. Not all protractors have the zero point where the vertex of the angle is to be placed on the base as shown. Clarify this point if the protractors being used are different than that shown. Also, the protractors in the classroom may not have a single scale. If students have difficulty with the double scale, black out one scale using a water-soluble felt pen.

## The Protractor

A standard unit of measure of an angle is the **degree**.

A **protractor** has a scale marked in degrees ( $^{\circ}$ ).



The measure of  $\angle AOB$  is  $40^{\circ}$ .

### Exercises

1. Follow these steps to measure an angle

Step 1

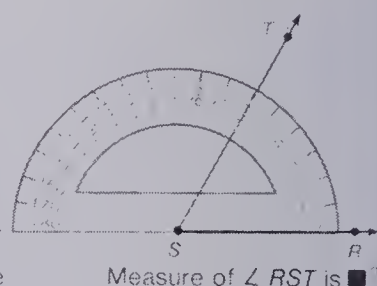
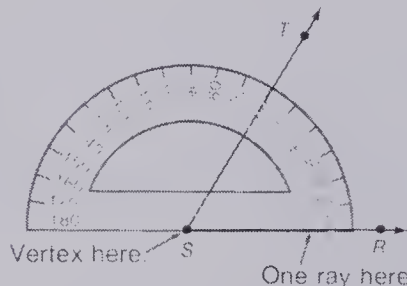
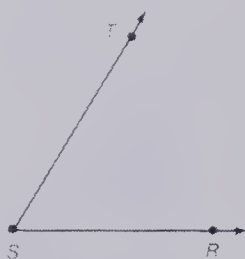
Draw an angle.

Step 2

Place protractor on angle like this.

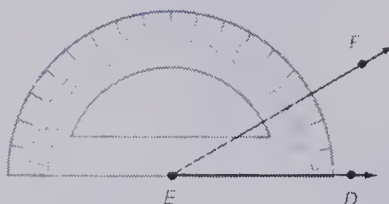
Step 3

Read the angle measure

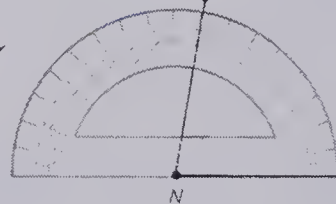


2. Read the measure of each angle

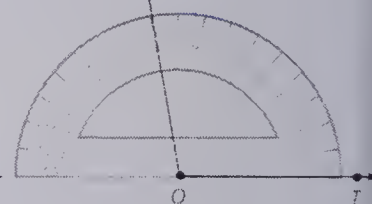
(a)  $30^{\circ}$



(b)  $80^{\circ}$



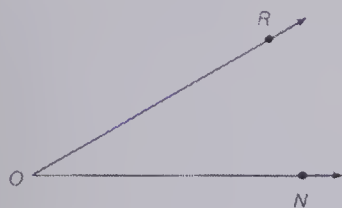
(c)  $100^{\circ}$



Place your protractor on each angle. Record the measure in degrees.

3. Acute angles

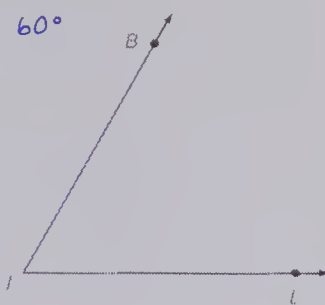
(a)  $30^\circ$



(b)  $80^\circ$

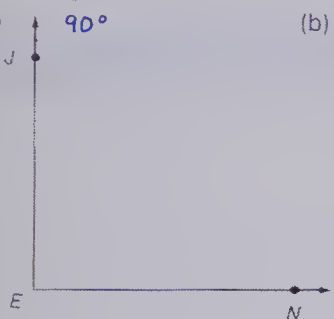


(c)  $60^\circ$

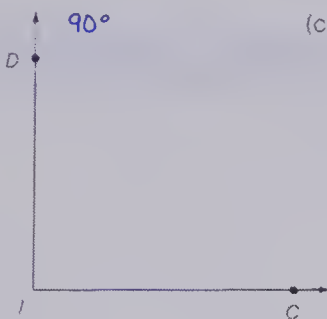


4. Right angles

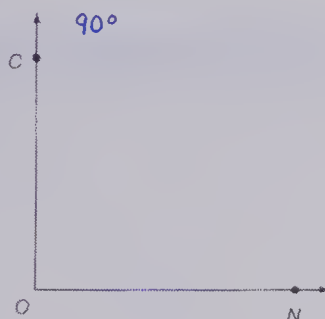
(a)  $90^\circ$



(b)  $90^\circ$

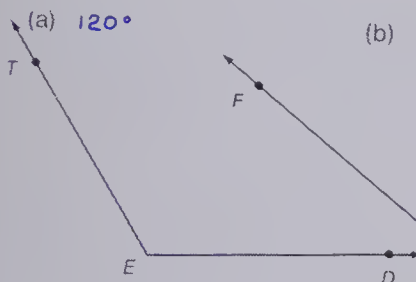


(c)  $90^\circ$

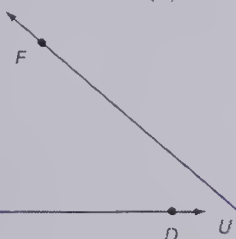


5. Obtuse angles

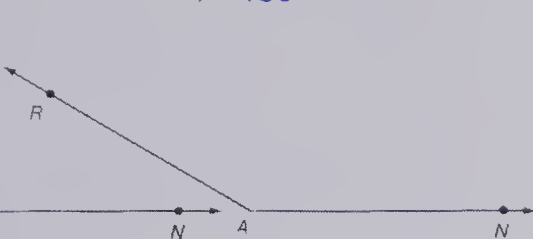
(a)  $120^\circ$



(b)  $140^\circ$



(c)  $150^\circ$



## ACTIVITIES

1. Draw a number of angles on the overhead projector transparency. Ask students to take turns illustrating to the class how to measure and record the angle of each. The angles should be multiples of  $10^\circ$ .

2. Ask the students to draw any triangle and measure its angles. Ask them to find the sum of the measures of the angles of each triangle. What do they notice? [The sum is  $180^\circ$  or close to it after allowing for error in measurement.]

Caution: This may require students to measure to the nearest degree. You may wish to duplicate a triangle with angles which are multiples of  $10^\circ$ .

3. Copy and complete.

- (a) A right angle has a measure of \_\_\_\_\_. [ $90^\circ$ ]
- (b) An acute angle has a measure of less than \_\_\_\_\_. [ $90^\circ$ ]
- (c) An obtuse angle has a measure greater than \_\_\_\_\_. [ $90^\circ$ ]

## EXTRA PRACTICE

Make copies of a sheet of large drawings of angles suitable for measuring with protractors. Ask the students to estimate the measure of them first, then check by using the protractor. Repeat for each angle.



## OBJECTIVE

To identify congruent shapes by tracing and matching

## PACING

Level A All

Level B All

Level C All

## VOCABULARY

polygon

## MATERIALS

paper suitable for making cutouts to be traced, scissors, tracing paper (not too thin), materials for tracing and cutting out

## SUGGESTIONS

**Initial Activity** Provide each student with an interesting shape. Ask him or her to trace the shape and cut it out. Discuss how the two shapes are alike (same size and shape). Tell them that the two shapes are *congruent*. Use leaves of flower cutouts or buildings, etc. as the shapes.

Using two congruent shapes review slides, flips, and turns.

## USING THE BOOK

The exercises should be completed by tracing and matching. Many students will be able to tell if pairs of triangles are not congruent and will simply say, "They are not the same shape." This may be probed further to get, "One triangle has an obtuse angle, while the other triangle has not. Therefore, the two are not congruent."

The four exercises all have pairs of congruent shapes. You may want to assign some that are not congruent. See the Extra Practice.

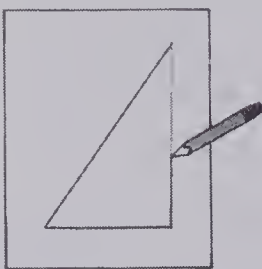
## ACTIVITIES

1. The students work in pairs. Provide each student with a geo-board. The first student is to make a triangle on the board. The partner makes a congruent triangle on his or her board. This can be made into a game with the students taking turns. A judge is necessary for each pair.

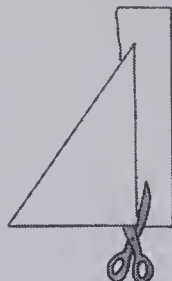
2. Provide an activity such as this. Look at the angles. Can you tell which shapes are *not* congruent without tracing? Why?

### Congruent Polygons

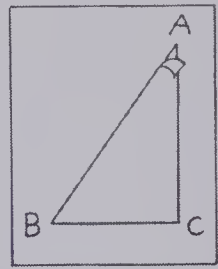
A **polygon** is a plane shape with 3 or more sides.



Trace one triangle.



Cut out carefully.



Check to see if it matches second triangle.

You may have to flip, slide, or turn the cutout to make it match the other shape.

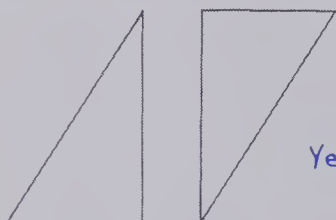
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**Two polygons are congruent if they have the same size and shape.**

#### Exercises

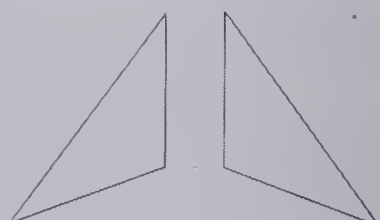
Are the polygons congruent? Guess. Then check.

1.



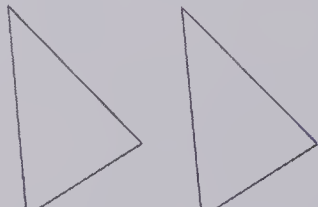
Yes

2.



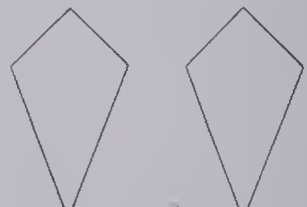
Yes

3.



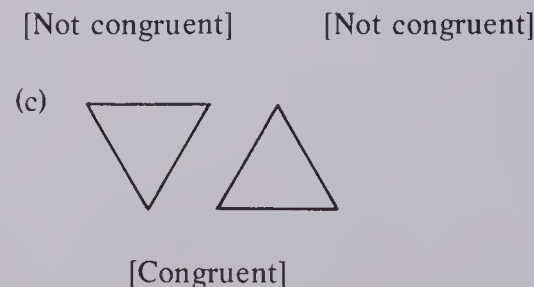
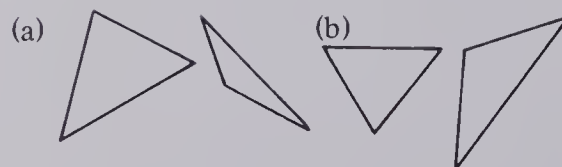
Yes

4.



Yes

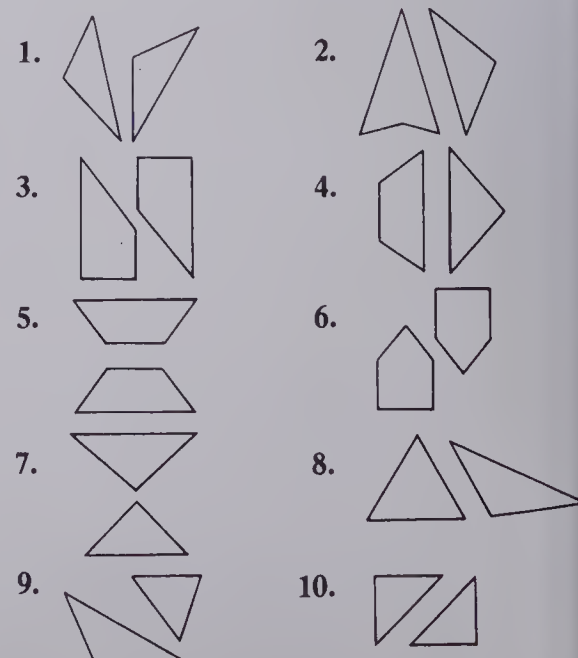
52 Congruent polygons



3. Play "Concentration" as described in the Activity Reservoir. Provide a deck of cards (approximately 15 pairs) of congruent polygons and angles.

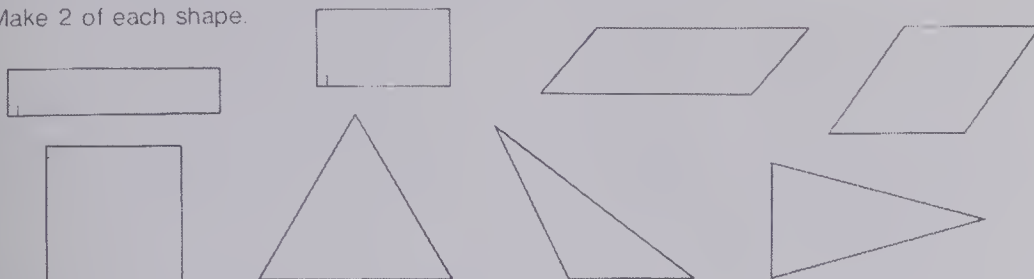
## EXTRA PRACTICE

Duplicate a page similar to this. [Exercises 1, 3, 5, 6, and 10 are congruent shapes. The others are not.]

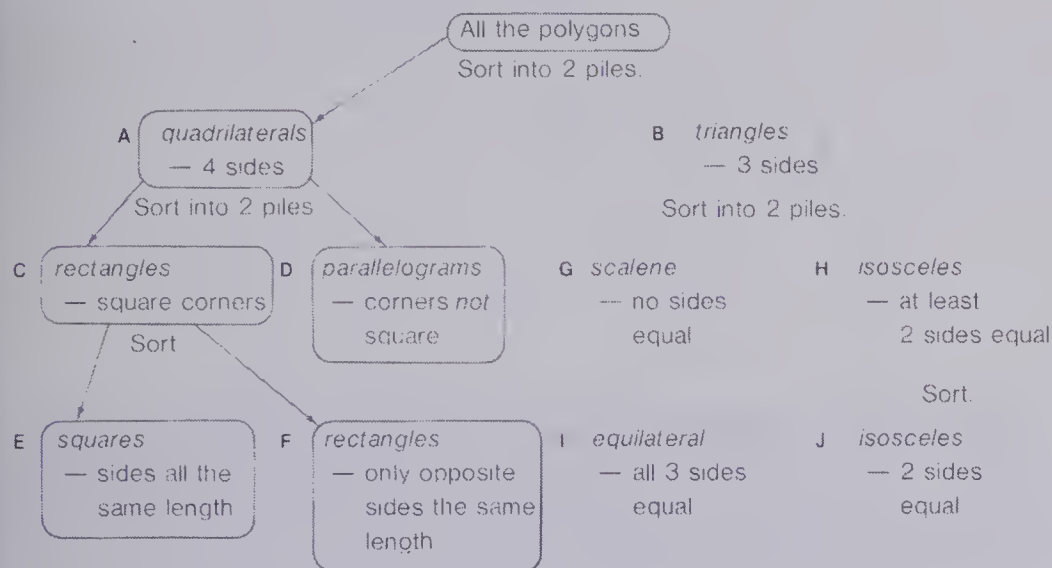


## Activity

Make 2 of each shape.



Put all the polygons in one pile and sort according to the following statements



Describe each polygon: square, rectangle, parallelogram, scalene triangle, isosceles triangle, equilateral triangle. The first one is done for you.

Square. 4 sides, square corners, all sides equal

## OBJECTIVE

To sort polygons

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

quadrilaterals, parallelograms, scalene, isosceles, equilateral

## MATERIALS

sets of shapes shown in the pupil display

## BACKGROUND

One of the easiest sorting procedures is to sort by putting the objects into 2 piles.

Has the stated property.

Does not have the stated property.

Some students may have difficulty with the negation "does not have".

## SUGGESTIONS

**Initial Activity** Use a simple set of shapes on the overhead projector. For example,



Ask the students to sort them into two piles and elicit from them the response of "has this property" and "does not have this property". One way is "sides are all straight lines" and "not all sides are straight lines"; or "has curved sides" and "not curved sides". Often the students will want to use two different attributes such as "has curved lines" and "has straight lines only". At times this works well, as illustrated in the first sorting in the activity which follows.

*Handwritten note:* Mary

## ANSWERS:

Rectangle: 4 sides, square corners  
Parallelogram: 4 sides, corners not square  
Scalene triangle: 3 sides, no sides equal  
Isosceles triangle: 3 sides, at least 2 sides equal  
Equilateral triangle: 3 sides, all 3 sides equal

## USING THE BOOK

Duplicate sheets of the shapes shown in the student's text for the students to cut out and use. An envelope should be provided for each set of shapes. Proceed through the sorting slowly with the students laying the shapes out on the floor or on a large table in the order shown on the page. Note that the description of a shape is the cumulative description in the flow chart; e.g., rectangle — a polygon with 4 sides, square corners ("only opposite sides the same length" identifies those rectangles with squares removed).

Be certain the students know what to do for the final describing exercise at the bottom of the page. You may wish to correct this exercise orally.

## ACTIVITIES

1. Ask the students to collect a variety of leaves. They can then sort them in any way they like. The essential activity is to write down the sorting procedures in chart form. There is no need to name the sets except for Pile A, B, C, etc. They may use such rules of sorting as long and thin or round; serrated edges or smooth edges; parallel veins or not parallel veins; green or other than green.

2. Ask the students to collect a variety of flowers or pictures of flowers. Sort them and record the rules for sorting. Draw a chart to show the sorting and rules.

## OBJECTIVE

To identify and match corresponding vertices of congruent triangles

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

vertex, vertices

## MATERIALS

geo-boards, cutouts, plastic transparent mirrors

## RELATED AIDS

HMS — DM13.

## BACKGROUND

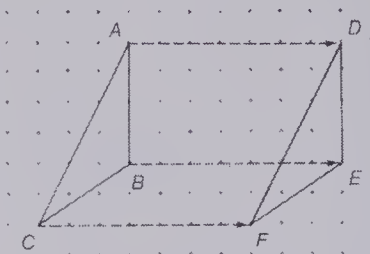
In a slide, flip, or turn (translation, reflection, or rotation respectively) the object and image are congruent. That is, the size and shape do not change. Only the position changes, and the attitude and orientation may change.

## SUGGESTIONS

**Initial Activity** Review slides, flips, and turns by giving each student an irregular shape, having them trace it, label the vertices, and then sliding it (later flipping and turning it). Emphasize that the shape and size do not change — only the position and the direction in which it sits may change.

Draw two congruent triangles on the chalkboard which are matched by a slide. (Two scalene right triangles are the easiest to work with.) Then, using coloured chalk, draw lines from a vertex to its corresponding (matching) vertex. Say, "These two vertices match." Then ask a student to draw a line between two other matching vertices. Repeat for two triangles matched by a (i) flip, (ii) turn.

## Matching Parts of Congruent Triangles



Vertex — corner

Vertices — plural  
for vertex

$A \rightarrow D$

Vertex A matches vertex D.

$B \rightarrow E$

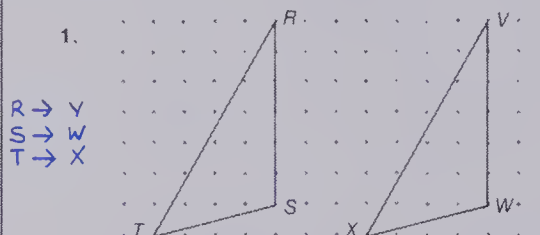
Vertex B matches vertex E.

$C \rightarrow F$

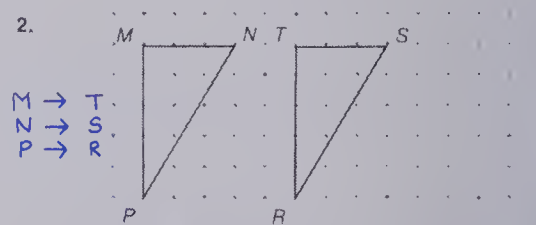
Vertex C matches vertex F.

### Exercises

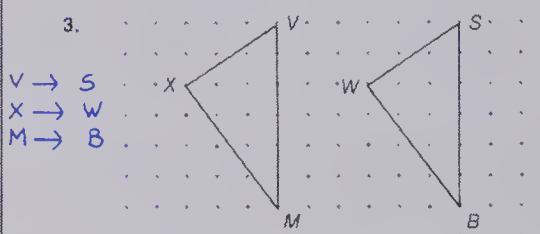
The triangles in each pair are congruent. They match by a **slide**. Name the vertices that match.



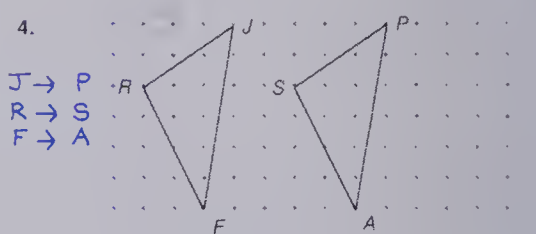
$R \rightarrow V$   
 $S \rightarrow W$   
 $T \rightarrow X$



$M \rightarrow T$   
 $N \rightarrow S$   
 $P \rightarrow R$



$V \rightarrow W$   
 $X \rightarrow M$   
 $S \rightarrow B$

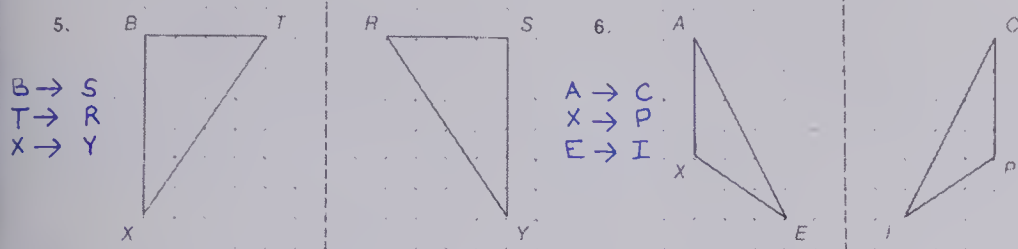


$J \rightarrow S$   
 $R \rightarrow P$   
 $F \rightarrow A$

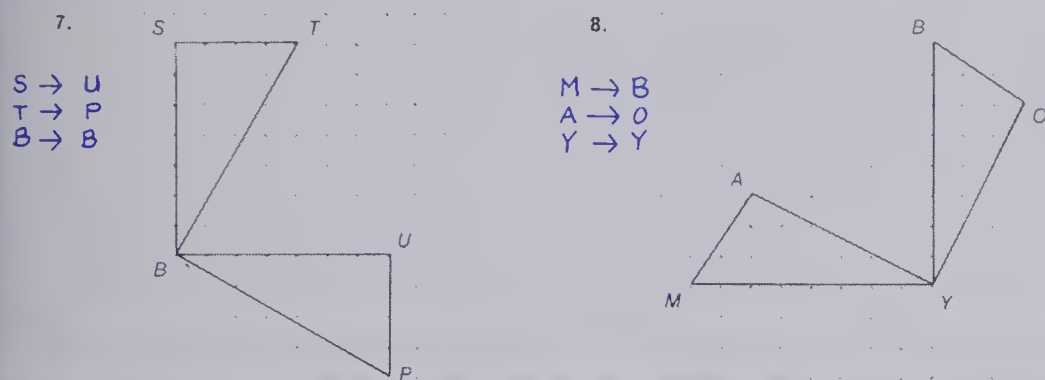
may 8/6



The triangles in each pair are congruent. They match by a **flip**.  
Name the matching vertices. Use a plastic mirror if necessary.



The triangles in each pair are congruent. They match by a **turn**.  
Name the matching vertices. Use cutouts if necessary.



## USING THE BOOK

It may be necessary for some students to trace the first triangle, label it, and then to move it to match the second triangle. Then they can readily see the matched vertices and sides. Encourage students to use the symbolism shown, i.e.,  $A \rightarrow D$ . If some students say "A arrow D", then have them write "vertex A matches vertex D", graduating first to saying this, then writing the shorthand later.  $A \rightarrow D$  should be read as, "vertex A matches vertex D."

There are two solutions to the Braintickler.

859	589
+347	+437
1206	1026

## ACTIVITIES

1. The students work in pairs. Provide each student with a geo-board. The first student makes a triangle. The partner makes a congruent triangle. The first puts a finger on one vertex of the triangle. The partner has to place a finger on the matching vertex. They take turns and continue to match all vertices.

Repeat the procedure, but this time the partner is allowed to turn the board before starting to match.

2. Place three irregular objects on a page, e.g., protractor, scissors, and compasses. Player A studies the position of each object, then closes his or her eyes while Player B moves one of the objects by a slide, flip, or turn. Player A opens his or her eyes and must identify the object moved and how it was moved.

## BRAINTICKLER

0 1 2 3 4 5 6 7 8 9

Use each number once only.

Make an addition question with the answer.

There are to be two three-digit numbers with the sum a four-digit number.

$$\begin{array}{r} 9 \\ + \quad 7 \\ \hline \end{array}$$

Corresponding vertices 55

ANSWERS:

Braintickler

589	539	439	489
+ 437	or + 487	or + 587	or + 537
1026	1026	1026	1026

May 6

## OBJECTIVE

To identify corresponding parts of congruent polygons

## PACING

Level A 1-8  
Level B All  
Level C All

## MATERIALS

materials for making cutouts

## RELATED AIDS

HMS — DM13.

## SUGGESTIONS

**Initial Activity** On the chalkboard or overhead projector, trace a polygon and label its vertices. Preferably, this should be an irregular quadrilateral or pentagon. Then, slide the polygon to the side and trace it again. Label each of the vertices with a different set of letters. Now ask the students, in turn, to identify matching vertices. Proceed to the identification of matching sides, and finally to matching angles (same as matching vertices). When speaking, use "side  $AB$  matches side  $MP$ ", but write the shorthand  $AB \rightarrow MP$ . Emphasize that this is a shorthand way of writing the longer sentence. Then ask what this means:  $\angle ABC \rightarrow \angle MPR$ . [Angle  $ABC$  matches angle  $MPR$ .] Repeat for flips and turns.

## USING THE BOOK

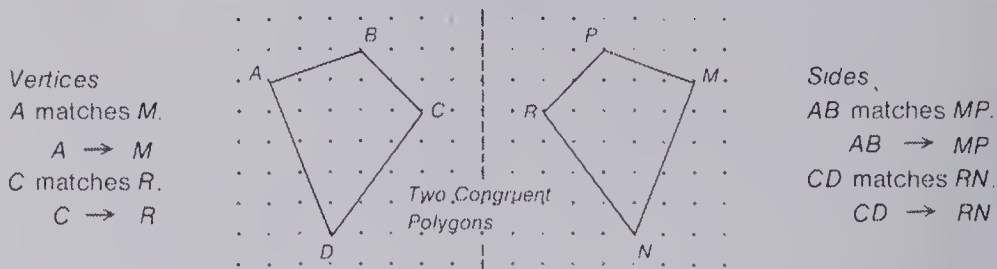
Discuss the display in the student's text. The students should say what is written there — the verbalizing is important. Then ask what matching pairs are not shown in the display. Have the students take turns writing the symbolic forms (if they are ready) of the other matchings on the chalkboard.

$\angle B \rightarrow \angle P$        $\angle BC \rightarrow \angle PR$   
 $\angle D \rightarrow \angle N$        $\angle AD \rightarrow \angle MN$

$\angle ABC \rightarrow \angle MPR$   
 $\angle BCD \rightarrow \angle PRN$   
 $\angle CDA \rightarrow \angle RNM$   
 $\angle DAB \rightarrow \angle NMP$

Do not concern the students with naming the angles in the same order as the corresponding vertices. That is, accept  $\angle ABC \rightarrow \angle RPM$  as well as  $\angle ABC \rightarrow \angle MPR$ . Students may want to trace and match some of the shapes in order to identify the corresponding parts. Encourage this practice. Emphasize that the shapes are congruent.

## Matching Parts of Congruent Polygons

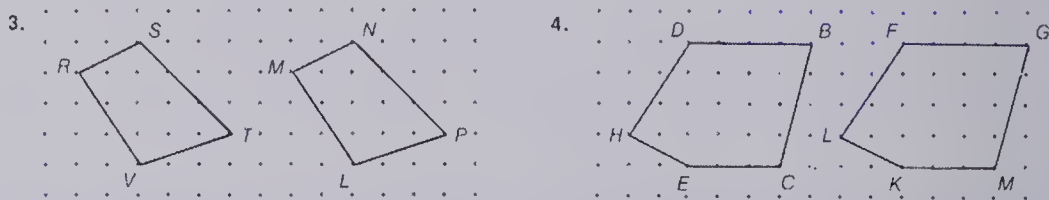


### Exercises

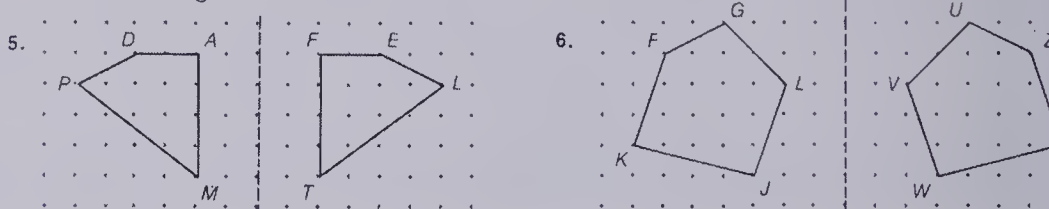
Refer to the display.

- Name the other matching vertices of the polygons.  $B \rightarrow P, D \rightarrow N$
- Name the other matching sides of the polygons.  $BC \rightarrow PR, AD \rightarrow MN$

The polygons in each pair are congruent. They match by a slide. Name the matching vertices and sides.



The polygons in each pair are congruent. They match by a flip. Name the matching vertices and sides.

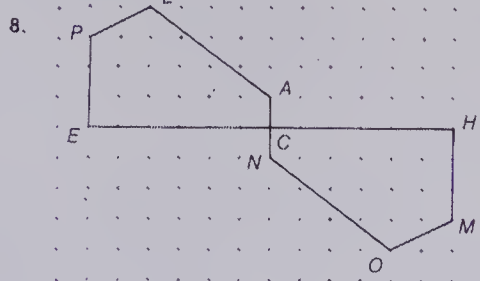
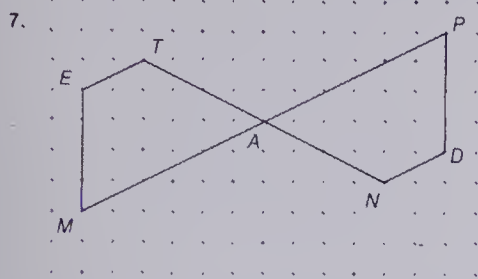


56 Corresponding sides

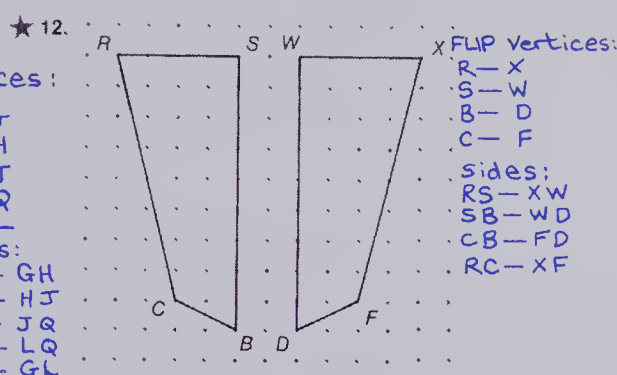
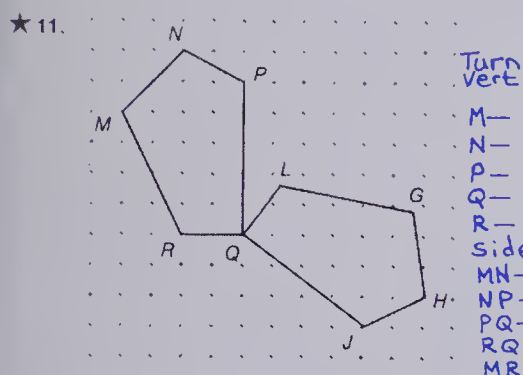
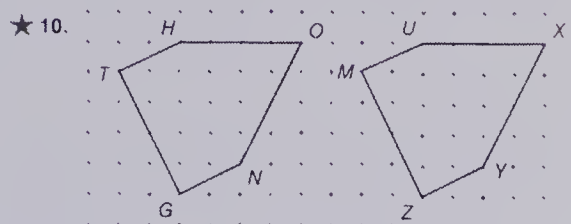
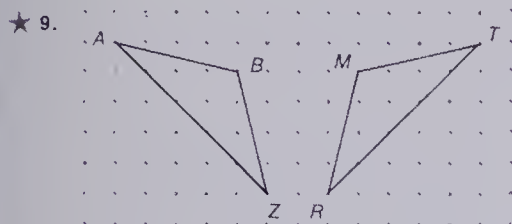
### ANSWERS:

3. Vertices:  $R \rightarrow M, S \rightarrow N, T \rightarrow P, V \rightarrow L$  Sides:  $RS \rightarrow MN, ST \rightarrow NP, TV \rightarrow PL, RV \rightarrow ML$  4. Vertices:  $D \rightarrow F, B \rightarrow G, C \rightarrow M, E \rightarrow K, H \rightarrow L$  Sides:  $DB \rightarrow FG, BC \rightarrow GM, EC \rightarrow KM, HE \rightarrow LK, DH \rightarrow FL$  5. Vertices:  $D \rightarrow E, A \rightarrow F, M \rightarrow T, P \rightarrow L$  Sides:  $DA \rightarrow EF, AM \rightarrow FT, PM \rightarrow LT, PD \rightarrow LE$  6. Vertices:  $F \rightarrow Z, G \rightarrow U, L \rightarrow V, J \rightarrow W, K \rightarrow Y$  Sides:  $FG \rightarrow ZU, GL \rightarrow UV, LJ \rightarrow VW, KJ \rightarrow YW, FK \rightarrow ZY$

The polygons in each pair are congruent. They match by a turn.  
Name the matching vertices and angles.



The polygons in each pair are congruent. Identify each as a turn, slide, or flip.  
Name the matching vertices and sides.



Turn  
Vertices:

M—G  
N—H  
P—J  
Q—Q  
R—L

Sides:

MN—GH  
NP—HJ  
PQ—JQ  
RQ—LQ  
MR—GL

FLIP Vertices:

R—X  
S—W  
B—D  
C—F

Sides:

RS—XW  
SB—WD  
CB—FD  
RC—XF

## ACTIVITIES

1. Each student cuts out a pattern of a flower. It is traced, then slid (flipped or turned), and traced again. Corresponding parts must be coloured the same colour. Colourful patterns using slides, flips, and turns can be made.

2. Repeat Activity 1 on pages 54 to 55 of the teaching notes, but polygons of more than three sides are to be used.

3. Repeat Activity 2 on pages 54 to 55 of the teaching notes, but polygons of more than three sides are to be used.

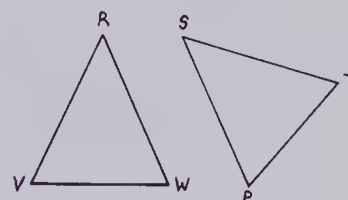
## EXTRA PRACTICE

If:  $\angle R$  matches  $\angle S$

$\angle V$  matches  $\angle P$

$\angle W$  matches  $\angle T$

name the matching (a) vertices, (b) sides.



Corresponding sides 57

## ANSWERS:

7. Vertices:  $T \rightarrow N$ ,  $A \rightarrow A$ ,  $M \rightarrow P$ ,  $E \rightarrow D$  Sides:  $ET \rightarrow DN$ ,  $TA \rightarrow NA$ ,  $MA \rightarrow PA$ ,  $EM \rightarrow DP$  8. Vertices:  $P \rightarrow M$ ,  $L \rightarrow O$ ,  $A \rightarrow N$ ,  $C \rightarrow C$ ,  $E \rightarrow H$  Sides:  $PL \rightarrow MO$ ,  $LA \rightarrow ON$ ,  $AC \rightarrow NC$ ,  $EC \rightarrow HC$ ,  $PE \rightarrow MH$  9. Congruent by a flip. Vertices:  $A \rightarrow T$ ,  $B \rightarrow M$ ,  $Z \rightarrow R$  Sides:  $AB \rightarrow TM$ ,  $BZ \rightarrow MR$ ,  $AZ \rightarrow TR$  10. Congruent by a slide. Vertices:  $T \rightarrow M$ ,  $H \rightarrow U$ ,  $O \rightarrow X$ ,  $N \rightarrow Y$ ,  $G \rightarrow Z$  Sides:  $TH \rightarrow MU$ ,  $HO \rightarrow UX$ ,  $ON \rightarrow XY$ ,  $GN \rightarrow ZY$ ,  $TG \rightarrow MZ$



## OBJECTIVE

To identify and draw parallel lines

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

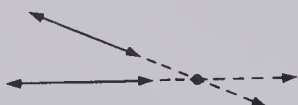
parallel, intersect(ing), identify

## MATERIALS

rulers

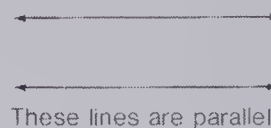
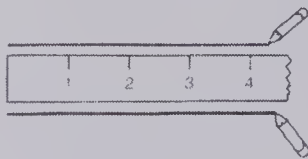
## BACKGROUND

Parallel lines are lines in the same plane which do not intersect. The arrowheads on the lines indicate that the lines go on infinitely, or as we might say with students, "on and on and on". Because we cannot possibly show all of the line, we use the arrowheads to indicate we have only drawn part of it. Hence, even though the two lines below are not shown to intersect, they in fact do so when more of the lines are shown as indicated by the dotted line portion.



## Parallel Lines

Marcus drew two **parallel lines** along the edge of his ruler

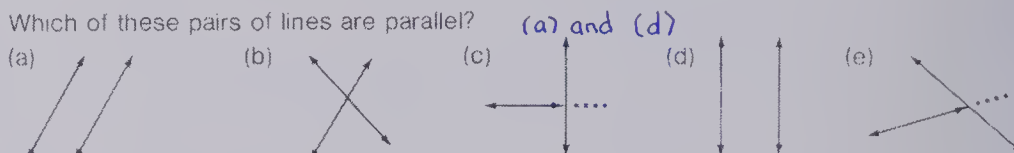


These lines are not parallel.  
They intersect.

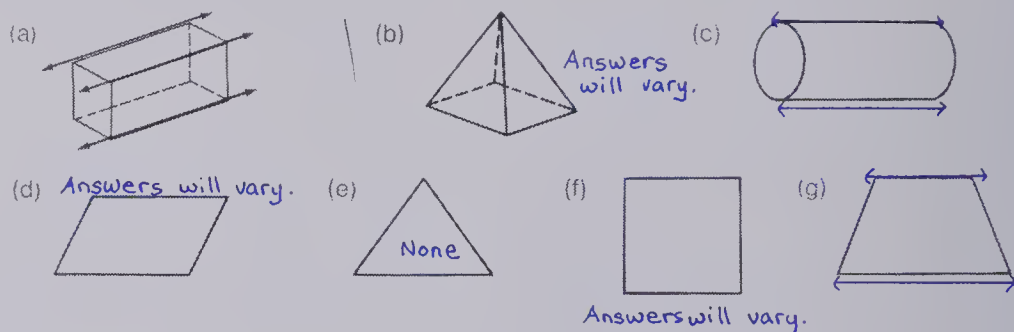


### Exercises

1. Which of these pairs of lines are parallel?



2. Identify parallel lines on these shapes. Trace each and draw on the parallel lines.



- Draw a pair of parallel lines using your ruler.
- Identify 5 sets of parallel lines in your classroom.
- Identify 5 sets of intersecting lines in your classroom.

## SUGGESTIONS

**Initial Activity** Draw two lines on the chalkboard using a ruler as in the pupil display. Point out that the arrowheads are used to show that only a portion of the line can be drawn. Also develop the idea that the lines are the same distance apart at any point along them. Show a pair of lines that intersect. Write the words "parallel" and "intersecting" beside the respective figures. Discuss lines in the classroom and outside which are either parallel or intersecting.

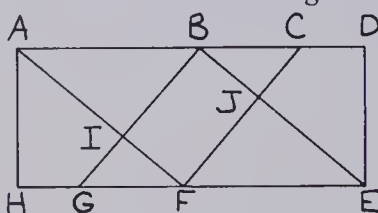
## USING THE BOOK

You may wish to complete this page together as a group. If so, have the shapes in Exercise 2 drawn on the chalkboard or prepared for distribution. If the exercises are to be completed in workbooks after suitable discussion and demonstration, be certain that the students are familiar with the accepted answer format.

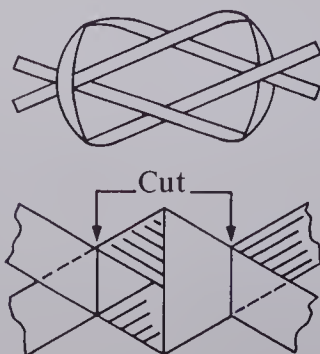
58 Identifying and drawing parallel lines

## ACTIVITIES

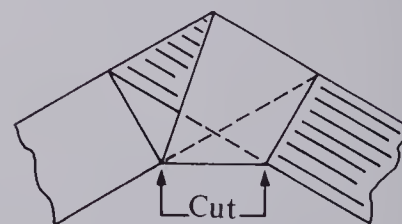
1. Make copies of a design similar to this. Have the students identify pairs of parallel lines and intersecting lines.



2. Provide the pupils with two strips of paper each about 4 cm wide and 20 cm long (adding machine tape works well). Show them how to tie a 6-sided shape with all sides congruent (regular hexagon). Ask about which sides are parallel.

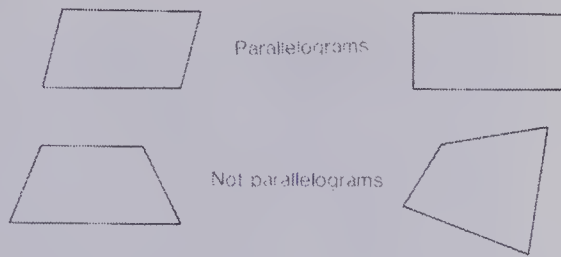
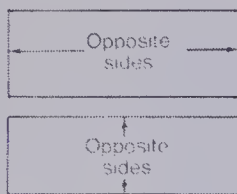


These strips can also be used to tie a 5-sided shape with all sides congruent (regular pentagon). Be sure to ask about parallel sides. [There are none.]



3. Review angles by having students identify right angles, acute angles, and obtuse angles in the design in Activity 1.

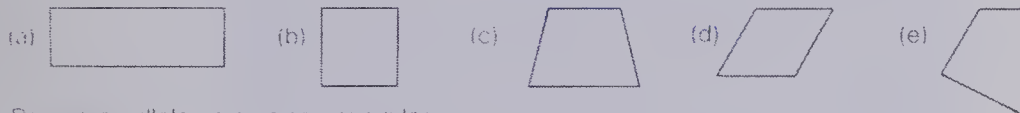
# Parallelograms



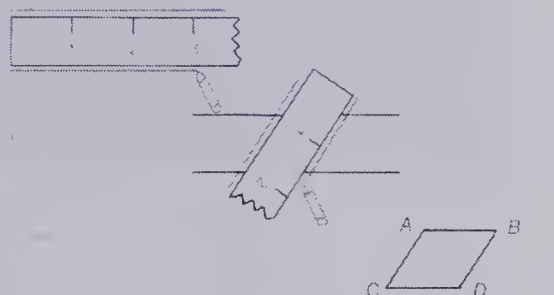
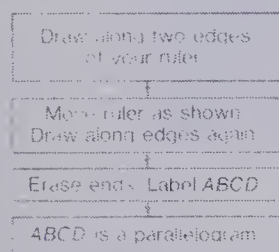
Parallelograms have (a) four sides  
(b) both pairs of opposite sides parallel

## Exercises

1. Which of these shapes are parallelograms? (a), (b), and (d)



2. Draw a parallelogram using your ruler



3. Use other objects to draw 5 different parallelograms

Hint:



4. Identify parallelograms in your classroom

## OBJECTIVE

To identify and to draw parallelograms

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

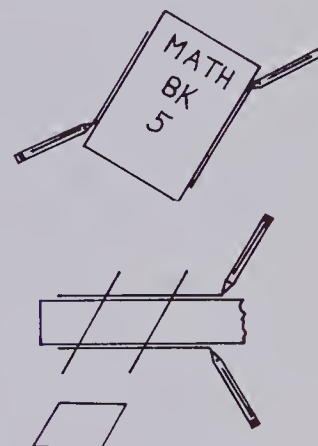
parallelograms, opposite sides

## MATERIALS

rulers

## SUGGESTIONS

**Initial Activity** On the chalkboard, use a book and ruler to draw a parallelogram.



Discuss which sides are parallel. Develop the notion of opposite sides. Elicit from the students that the properties of a parallelogram are (a) 4 sided, (b) opposite sides parallel.

## USING THE BOOK

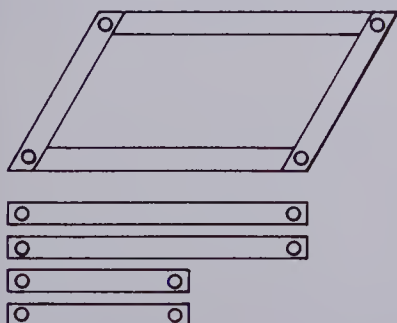
Reinforce the "opposite sides" aspect of parallelograms. Draw a number of quadrilaterals on the chalkboard or overhead projector: rectangles, squares, parallelograms that are not rectangles, and some quadrilaterals with all sides different. Elicit from the students which are and are not parallelograms and why. Do Exercises 1 and 4 orally as a group. Be sure to elicit the reason for each response. If necessary, proceed step by step through the flow-chart approach of Exercises 2 and 3 to produce the various parallelograms.

May 13

## ACTIVITIES

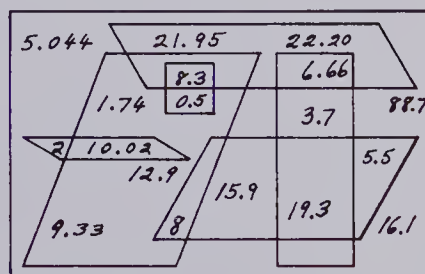
1. Provide the students with copies of the diagram from Activity 1, page 58, of the teaching notes. Ask the students to trace and colour each parallelogram.

2. Provide each pair of students with strips of cardboard (students can also make their own), and 4 paper fasteners to make a model parallelogram. Have students trace inside to get different parallelograms. Have them use their parallelograms to make "parallelopatterns".



3. Provide students with a

"Numbers in Parallelograms" display as shown.



Use a different coloured marker for each parallelogram.

This should be accompanied by activity cards such as the following.

- Write the numbers that are not in any parallelogram at all.
- What is the sum of the numbers in the green parallelogram?
- As above in (b) for other colours.
- What is the sum of the numbers in the red parallelogram but not in the blue parallelogram?
- Write the greatest (or least) number in the black parallelogram, etc.

## OBJECTIVE

To draw pictures of cylinders and cones

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

models and/or pictures of cylindrical and conical shapes

## RELATED AIDS

HMS — DM11.

## SUGGESTIONS

**Initial Activity** Bring models and pictures of cylinders and cones to class. Discuss the frequency and use of cylindrical- and conical-shaped things in buildings and machinery (cylinders in car engines; wheels as short, wide cylinders; pipe sections, tin cans, etc. as cylinders; funnels, pencil tips, and satellite antennae as cones). Search for and list the cylindrical and conical shapes in the immediate environment.

## USING THE BOOK

In one hand, hold a glass jar or tin can as a model of a cylinder so that students can compare your step-by-step drawing of a cylinder with the model before them. Have them draw each step after you as you repeat the steps again. Practise this several times. Repeat for cones.

If students become adept at drawing cylinders and cones, you might have them skip Exercises 1 to 10 and proceed directly to Exercises 11 to 15. However, any student uncertain of the procedure can use the intermediate steps by doing Exercises 1 to 10.

## ACTIVITIES

1. Some students might enjoy cutting up old magazines to make a collage or a bulletin-board display of cylindrical- and conical-shaped things around us.

2. Have students write a short story about their WHATSIT. (See Exercise 15.) The story might tell what the WHATSIT can do, what it has done; or it might be involved in a short mystery story.

## Drawing Cylinders and Cones

To draw a cylinder:

*Step 1*

Draw a flattened circle for the top.



*Step 2*

Draw the sides.



*Step 3*

Draw a flattened circle for the bottom.



*Step 4*

Use dotted line to show part out of sight.



To draw a cone:

*Step 1*

Draw two congruent sides of a triangle.



*Step 2*

Draw a flattened circle for the base.



*Step 3*

Use dotted line to show part out of sight.



### Exercises

Trace and complete each cylinder.

1.



2.



3.



4.



5.



Trace and complete each cone.

6.



7.



8.



9.



10.



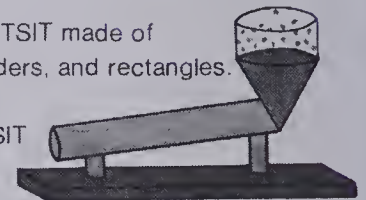
11. Draw a tall thin cylinder.

12. Draw a short thick cylinder.

13. Draw a tall thin cone.

14. Draw a short thick cone.

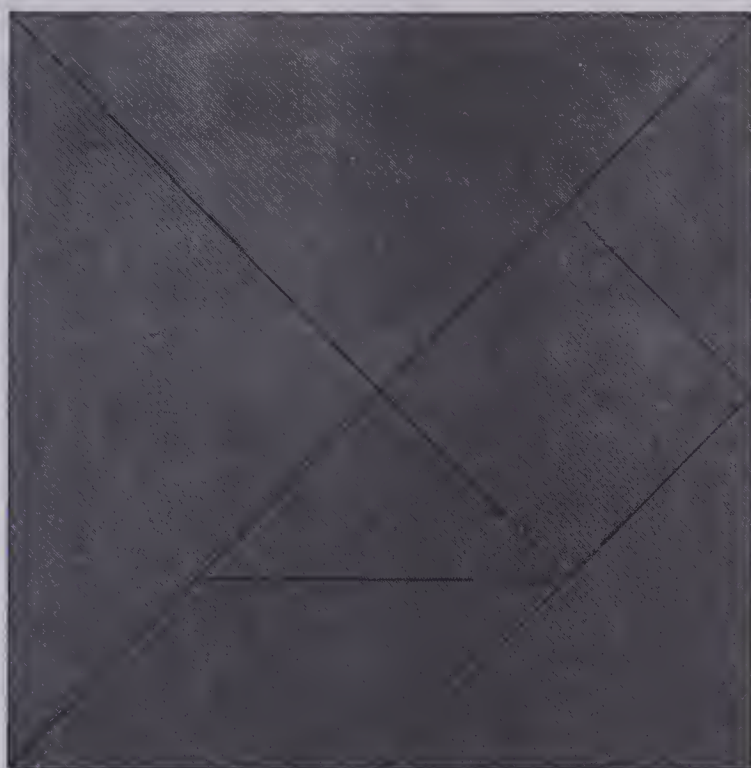
15. Draw a WHATSIT made of cones, cylinders, and rectangles. What does your WHATSIT do?



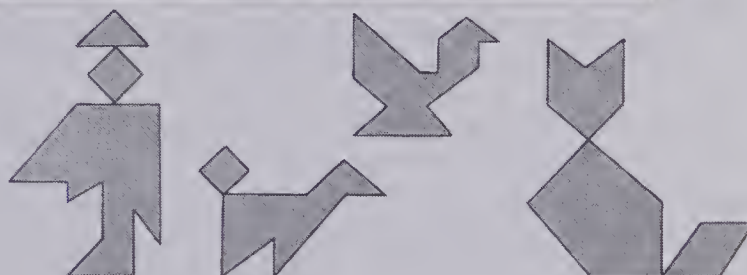


## A Chinese Puzzle

Make this tangram.



Trace the shape.  
Glue it on cardboard.  
Cut carefully into 7 pieces.  
Make different patterns.  
Trace and colour each shape.



Tangrams 61

## OBJECTIVE

To make patterns with tangrams

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

tangram

## MATERIALS

materials for making tangrams as mentioned in the student's text

## BACKGROUND

The tangram is one of the oldest square puzzles in the world. About 4000 years ago, Chinese mathematicians divided a square shape into five triangles, a small square, and a parallelogram. It is said that Napoleon amused himself with this puzzle when he was in prison.

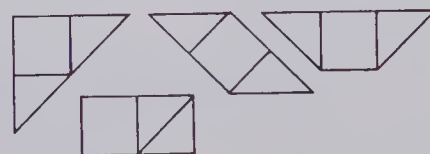
## USING THE BOOK

With guidance some classes are capable of drawing their own tangram patterns on stiff cardboard. However, you may wish to duplicate and distribute the pattern in order to save time.

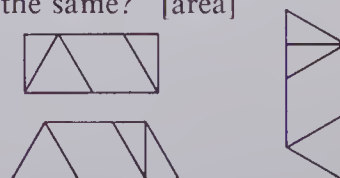
After the students have made the patterns shown, ask them to make their own figures. Display some of the figures on the bulletin board. Provide the students with labelled envelopes in which to place their playing pieces.

## ACTIVITIES

1. Distribute shapes such as the following. (Use the correct size.) Have the students use the three pieces — the two smallest triangles and the square to cover each of the other shapes. Have them draw the outline of each piece to show where it fits.



2. As above, but use four pieces. Ask, "Though the shape changes, what stays the same?" [area]



3. Have the students use more pieces to make various shapes. They should outline the overall shape and exchange these for study by classmates (as in Activities 1 and 2).

OBJECTIVE

To solve problems involving more than one step

PACING

- Level A 1-5
- Level B 1-6
- Level C All

VOCABULARY

concession, profit, expenses

SUGGESTIONS

**Initial Activity** Use the Career Awareness notes in the Chapter Overview in discussing the business of various concession operations. Review Professor Q's 4 questions. Pose a 2-step problem and illustrate the steps in its solution. *Problem:*

A popcorn man bought 2 cans of popping corn at \$1.29 each and 1 kg of butter for \$1.39.

How much did all of this cost?

*Solution:*

- Step 1. cost of popping corn  
 $2 \times \$1.29 = \$2.58$
- Step 2. cost of butter  
 $\underline{1.39}$   
total cost (add)  $\$3.97$
- Step 3. The cost was \$3.97.

USING THE BOOK

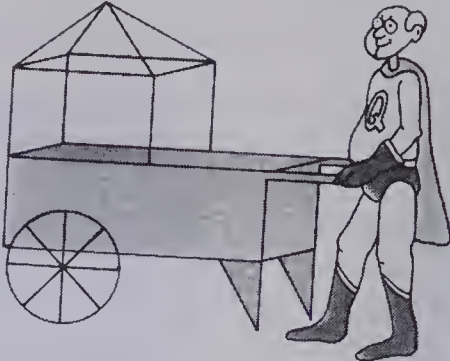
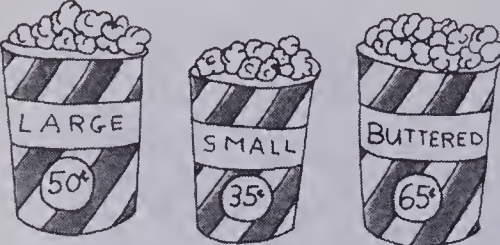
If necessary, provide assistance in reading the problems. Assign the exercises and move about the room assisting where necessary.

You may find it useful to have the steps in problem solving displayed somewhere in the classroom for easy reference. Encourage students to answer Professor Q's questions mentally. Those pupils with, as yet, weak organizational skills may benefit from writing brief answers to the steps to help keep on track.

ACTIVITIES

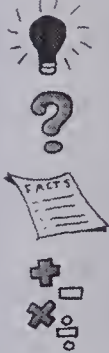
1. Students might write a brief story "A Day in the Life of a Concession Operator".
2. Very often people think of concession operators in conjunction with fairs, exhibitions, sporting events, carnivals, etc. Students could draw a mural of such an event showing various concession businesses.
3. Students might enjoy a simplified, guided "cost and profit" analysis of a potential concession business. They could be involved in soft drink sales for example. Have students investigate the cost of flavourings, sugar, paper cups, ice, etc. together

### The Concession Business



1. The popcorn man sold 2 large, 3 small, and 2 buttered boxes of popcorn. How much did this order cost? **\$3.35**
2. Expenses for one day were \$6.50. Meals cost \$5.10 Total sales were \$74.65 How much more was his total sales than the meals and expenses together? **\$63.05**
3. One can of corn makes 24 large and 12 small boxes. In one day 6 cans were used. How many boxes altogether? **216**
4. One day at the beach the popcorn man sold 84 large, 70 small, and 65 buttered boxes of popcorn. How much did he receive? **\$108.75**
5. One can of corn makes 30 large boxes He plans to sell 60 large boxes in the morning and 120 large boxes in the afternoon. How many cans of corn does he need? **6**
6. A customer gave him a ten-dollar bill for 5 large, 2 small, and 4 buttered boxes of popcorn What change should the customer get? **\$4.20**
- ★ 7. The popcorn man makes 25¢ profit on each box he sells He sold 51 boxes in the morning, 36 boxes in the afternoon, and 22 boxes in the evening How much profit altogether for that day? **\$27.25**

Remember Professor Q's questions



with the quantity of drinks made, the amount per cup, price, and profit on the hypothetical sales of various numbers of cups per day.

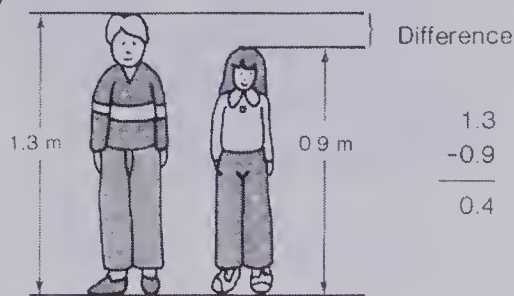


# Drawing Pictures to Solve Problems

Drawing a picture often helps solve a problem.

Jesse is 1.3 m tall.  
Bess is 0.9 m tall.  
How much taller is Jesse?

A picture may look like this.



Jesse is 0.4 m taller than Bess.

## Exercises

Draw a picture for each. Solve.

- Bob's dog is 0.9 m tall.  
Bill's dog is 0.7 m tall.  
How much taller is Bob's dog? **0.2 m**
- Brent ran 4.5 m.  
Bob ran 3.6 m.  
How much farther did Brent run? **0.9 m**
- It is 1.6 km from Donna's house to her school.  
Donna walks 0.8 km towards school.  
How much farther has she to go? **0.8 km**
- The sides of a triangle are 11.2 cm, 8.8 cm, and 14.6 cm.  
How far around the triangle? **34.6 cm**
- Muriel threw the ball 3.3 m.  
Debbie threw the ball 4.1 m.  
How much farther did Debbie throw the ball? **0.8 m**
- Freddy, the frog, jumped 1.3 m in the first jump.  
Then he jumped 0.8 m.  
How far did he jump altogether? **2.1 m**
- It is 2.1 km to the ski lodge.  
Melvin skis 1.7 km.  
How much farther has he to go? **0.4 km**
- The long side of a rectangle is 4.3 cm.  
The short side is 2.8 cm.  
How far around the rectangle? **14.2 cm**

Problems, drawing pictures 63

## OBJECTIVE

To draw pictures to help solve problems

## PACING

Level A 1-7  
Level B 1-7  
Level C All

## RELATED AIDS

HMS — DM14.

## BACKGROUND

A sketch that illustrates a problem often provides additional cues to its solution. While some of the problems may be solved without the picture, students should draw a picture for each in order to practise and to get into the habit for more difficult problems later.

## USING THE BOOK

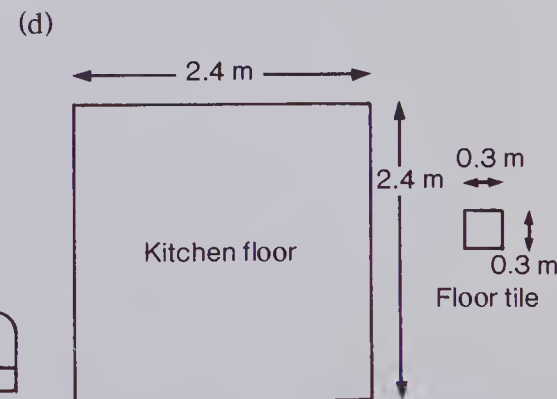
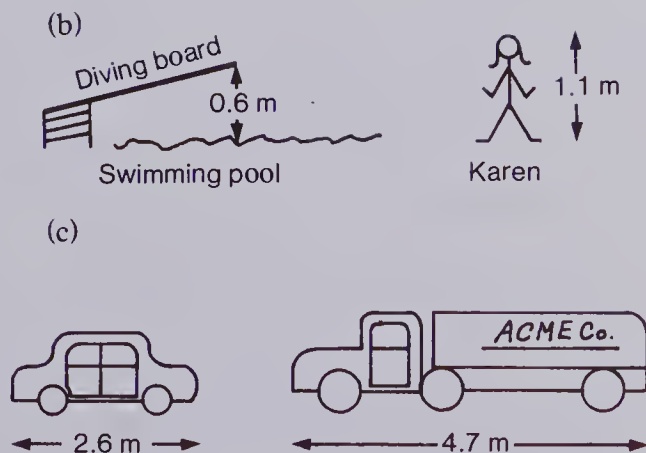
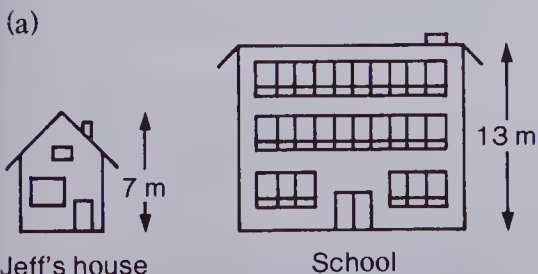
Illustrate the problem in the pupil display with your own diagram. Emphasize that the diagram need not be a masterpiece but need only illustrate the facts. Hence, stick men and women, stick dogs and cats, etc. are absolutely acceptable. However, the fact that one is taller than the other; one runs a distance farther than another; and so on should be shown. Label fully with the details.

Go through the exercises together to ensure there are no reading problems. Assign the exercises. Be certain that students are familiar with the accepted answer format.

## ACTIVITIES

1. Encourage the students by asking several to make a larger demonstration picture to illustrate certain problems from this page and then show the solution. These can be posted on the bulletin board.

2. Prepare some simple diagram sets on the chalkboard or bulletin board of the type shown below. Have the pupils write a word problem to match each diagram.





## OBJECTIVES

To approximate answers by rounding before calculating  
To practise rounding

## PACING

Level A 1-4, Tune Up  
Level B 1-4, Tune Up  
Level C 2-5, Tune Up is optional

## VOCABULARY

approximations, ski equipment, basketball shoes, uniform

## SUGGESTIONS

**Initial Activity** Review the rules for rounding as introduced on pages 27 and 28:

- Locate the digit to be rounded.
- Look at the digit to the right.
- If this digit is less than 5, leave the first digit as it is.
- If this digit is 5 or greater, round the first digit up to one larger.
- Write the whole number with the appropriate number of zeros.

Review rounding money to the nearest ten dollars. Use these for practice if necessary.

- (a) \$27 (b) \$31 (c) \$54  
(d) \$65 (e) \$18.75 (f) \$22.95  
(g) \$49.10 (h) \$68.25 (i) \$19.39

## USING THE BOOK

Discuss the pupil display thoroughly. You may wish to do this when the students' books are closed so they do not see the solution. Clearly set out the problem in step form so that students can pattern steps for subsequent problems. Emphasize that the approximate answers are just that — approximations. The answers are close to what the actual answers will be. You may illustrate this by calculating the actual answer to the problem in the display and comparing.

Read through the problems together to make certain that reading level is not further complicating matters for any students. The answer for Exercise 1 is in the back of the book for those who would like to check their results. All five problems involve dollar amounts and rounding to the nearest ten dollars. Point out that to approximate the answer, as indicated in the instructions, simply means to solve and write the answer in approximate numbers.

The Tune Up exercises have been included to help as a review of pages 27 to 29 and as a preparation aid for page

## Approximations

Alice bought ski equipment.  
skis \$69.75  
boots \$73.65  
ski poles \$26.75

Approximately how much were the three items?  
Round to the nearest ten dollars.



\$69.75 → \$ 70  
\$73.65 → \$ 70  
\$26.75 → \$ 30

Approximate total was \$170

### Exercises

Round first to nearest ten dollars. Then approximate the answer

1. Approximately how much more did Alice pay for the skis than for the poles? **\$40**
2. Gil bought skates for \$78.65, hockey pads for \$54.85, and 5 hockey sticks for \$32.50. Approximately how much did he pay for the equipment? **\$160**
3. Approximately how much more did Gil pay for the skates than for the hockey pads? **\$30**
4. A set of golf clubs cost \$145.75, a golf cart cost \$32.54, and golf shoes cost \$58.23. Approximately how much are the three items? **\$240**
5. A pair of basketball shoes costs \$22.65, a uniform costs \$16.75, and a basketball costs \$38.50. Approximately how much more do the shoes cost than the uniform? **\$0**

## Tune Up

Round each to the nearest (a) hundred (b) thousand (c) ten thousand.

1. 52 345      2. 37 294      3. 18 091      4. 63 545      5. 11 756

Round to the nearest (a) million (b) ten million.

6. 17 543 211      7. 63 456 754      8. 88 954 329

64 Problem Solving: approximations

### ANSWERS:

#### Tune Up

1. (a) 52 300 (b) 52 000 (c) 50 000      2. (a) 37 300 (b) 37 000 (c) 40 000  
3. (a) 18 100 (b) 18 000 (c) 20 000      4. (a) 63 500 (b) 64 000 (c) 60 000  
5. (a) 11 800 (b) 12 000 (c) 10 000      6. (a) 18 000 000 (b) 20 000 000  
7. (a) 63 000 000 (b) 60 000 000      8. (a) 89 000 000 (b) 90 000 000

65. For these exercises, be certain that the students are familiar with an accepted answer format.

## ACTIVITIES

1. See the Activities listed for pages 27 to 29 in the teaching notes for ideas that can be used here.

2. Display old merchandise catalogues. Have the students cut out their purchases, round the amounts, and give an approximate total for the items they chose.

3. See the "Batter Up" game in the Activity Reservoir. Use a number of skill cards which deal with rounding.

3468 → ? nearest thousand	\$68.75 → ? nearest ten dollars	8 622 222 → ? nearest million
---------------------------------	---------------------------------------	-------------------------------------

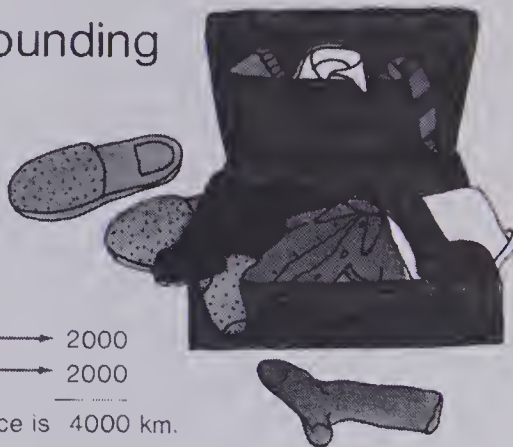
## EXTRA PRACTICE

1. Round these to the nearest ten dollars.  
(a) \$63.22 (b) \$84.95 (c) \$65.60  
(d) \$71.80 (e) \$39.50 (f) \$142.71  
(g) \$20.99 (h) \$338.86 (i) \$472.70
2. Round these to the nearest whole number.  
(a) \$2.65 (b) \$8.42 (c) \$12.56  
(d) \$22.95 (e) \$1.91 (f) \$44.39  
(g) \$5.55 (h) \$13.49 (i) \$199.29
3. A tennis racquet cost \$59.95, shoes \$32.95, and tennis balls were \$4.59 per can.  
(a) Approximately how much did the racquet and shoes cost together?  
(b) Approximately how much more was the tennis racquet than the shoes?  
(c) Approximately how much would 3 cans of balls cost?

## Using Rounding

On a vacation Franz travelled 1762 km by car and 2341 km by airplane.  
Approximately how far did Franz travel in all?

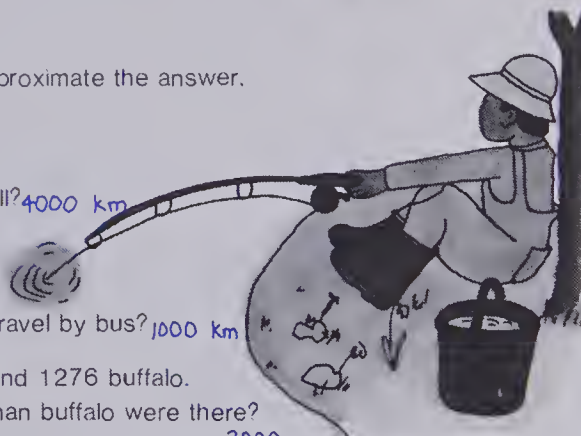
Round to the nearest thousand: 1762 → 2000  
2341 → 2000  
Approximate distance is 4000 km.



### Exercises

Round first to the nearest thousand. Then approximate the answer.

- Betty travelled 2340 km by car.  
She travelled 1651 km by airplane.  
Approximately how far did she travel in all? **4000 km**
- Horace travelled 2675 km by bus.  
He travelled 1811 km by train.  
Approximately how much farther did he travel by bus? **1000 km**
- A wildlife officer counted 3756 caribou and 1276 buffalo.  
Approximately how many more caribou than buffalo were there? **3000**
- The Fish and Game Association planted 15 356 fingerlings in Trout Lake, 27 635 fingerlings in Bow Lake, and 32 399 fingerlings in Rainbow Lake.  
Approximately how many fingerlings were planted in all? **75 000**
- On a round-the-world trip, Lopez flew 18 395 km, travelled by ship 22 675 km, and travelled by bus 17 560 km.  
Approximately how far did Lopez travel in all? **59 000 km**



Approximations in problem solving 65

## OBJECTIVE

To use approximations in problem solving

## PACING

Level A 1-3  
Level B All  
Level C All

## VOCABULARY

vacation, wildlife officer, caribou, buffalo, association, fingerlings

## BACKGROUND

While most of the previous page dealt with rounding to the nearest ten dollars, this page is concerned with rounding whole numbers to the nearest thousand.

## SUGGESTIONS

**Initial Activity** Use the following numbers as a basis for a review of rounding to the nearest thousand.

2145	3505	1999
4321	5678	8500
4931	45 644	78 345
69 564	79 671	99 831

If you have not already done so, you may wish to display the general steps in the rounding process (see pages 27 and 28) for reference while completing the word problems on this page.

## USING THE BOOK

Read through the problem in the pupil display. Be certain that the students are aware of how the approximate answer was arrived at using rounding. Emphasize that this is an approximate answer only. You may wish to demonstrate how close the approximation is to the actual distance Franz travelled.

You may wish to read through the exercises first before assigning them to make sure that reading level is not an obstacle.

## ACTIVITIES

- For a quick-to-make activity to reinforce rounding, prepare
  - ten containers (boxes, tins, empty milk cartons, etc.) labelled either from 100 to 1000 (to practise rounding to the nearest 100), or from 1000 to 10 000 (to practise rounding to the nearest 1000).
  - a deck of appropriately numbered cards, i.e., 365, 428, 621, etc.; or 4667, 8520, 9114, etc.

Have pupils singly, or as small groups, select cards and sort them into their appropriate containers. For example, if rounding is being done to the nearest 100, a 428 card should be placed in the 400 box, and so on. This activity can easily be adjusted to suit the needs of the group.

2. If you have not already done so, see the Activities listed for pages 27 to 29 and 64 in the teaching notes for ideas that could be used here.

3. Both the games "Slalom" and "Spider and the Fly" as described in the Activity Reservoir can be used to

maintain rounding skills. Both games will require skill cards such as these.

1276 → ? nearest thousand	\$1585.90 → ? nearest thousand	1276 → ? nearest hundred
---------------------------------	--------------------------------------	--------------------------------

## EXTRA PRACTICE

- Round each to the nearest (i) thousand (ii) ten thousand.  
(a) 62 225 (b) 33 850 (c) 76 499  
(d) 27 230 (e) 16 620

Population by First Language in Canada	
English	12 973 810
French	5 793 650
German	541 085
Italian	583 360
Ukrainian	309 855
Indian and Eskimo	179 825
All others	1 214 740

- Use the table and round to the nearest hundred thousand. Approximate the answers.
  - How many more people have English as a first language than French?
  - Are there more people with English as a first language than all others together?
  - Of those listed, which two are about the same population as German?
  - What is the total of all those shown?



OBJECTIVE

To evaluate achievement of the chapter objectives

PACING

- Level A All
- Level B All
- Level C All

RELATED AIDS

HMS — DM15.

USING THE BOOK


Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a large number of students had difficulty with a particular topic or concept.

The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 36).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

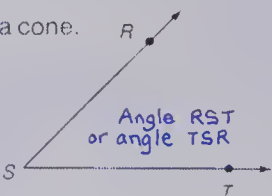
Test Item	Objective	Text Page Number
1, 9	A	39, 60
2, 5	B	41, 48
4, 8	C	44, 46
6	D	54
7	E	63

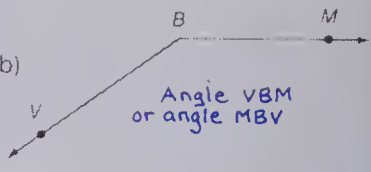
Chapter Test



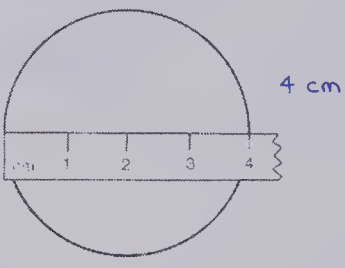
1. Draw a rectangular prism and a cone.

2. Name each angle.

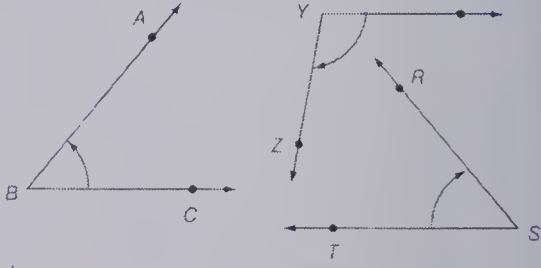
(a) 

(b) 

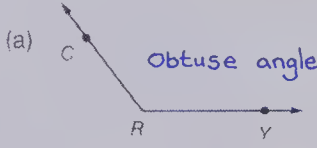
3. Measure the diameter in centimetres.

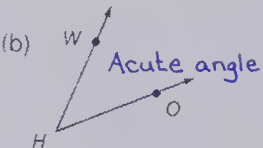


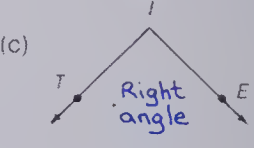
4. Which angle is congruent to  $\angle ABC$ ?  $\angle RST$



5. Name each angle as acute, obtuse, or right angle.

(a) 

(b) 

(c) 

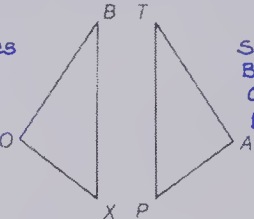
6. The polygons are congruent. Name the matching vertices and sides.

Vertices

$B \rightarrow T$

$O \rightarrow A$

$X \rightarrow P$



Sides

$BO \rightarrow TA$

$OX \rightarrow AP$

$BX \rightarrow TP$

7. Draw a picture for each. Solve

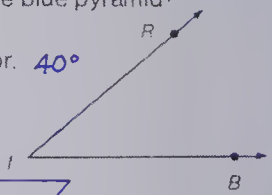
A red pyramid is 38.4 cm tall.

A blue pyramid is 96.8 cm tall?


How much taller is the blue pyramid?

Handwritten: 58.4 cm

8. Measure using a protractor.  $40^\circ$



9. Draw a parallelogram.





# Cumulative Review

Compare these numbers. Use  $>$ ,  $<$ , or  $=$ .

1.  $247.93 \overset{>}{\bullet} 247.34$

2.  $19486 \overset{>}{\bullet} 1942.9$

Round to the nearest tenth.

3.  $48.4$   
 $48.394$

4.  $0.2$   
 $0.24$

5.  $1.8$   
 $1.752$

Round to the nearest hundredth.

6.  $12.07$   
 $12.072$

7.  $1.45$   
 $1.445$

8.  $127.00$   
 $127.$

Add.

9.  $0.27$   
 $+ 1.69$   

---

 $1.96$

10.  $43.07$   
 $+ 19.58$   

---

 $62.65$

11.  $472\ 898$   
 $+ 287\ 545$   

---

 $760\ 443$

Subtract.

12.  $6.09$   
 $- 3.27$   

---

 $2.82$

13.  $324.48$   
 $- 170.52$   

---

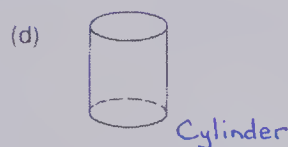
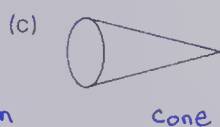
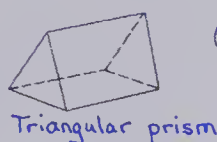
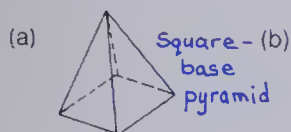
 $153.96$

14.  $84\ 631$   
 $- 36\ 097$   

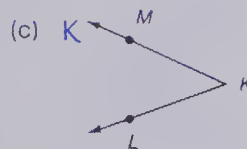
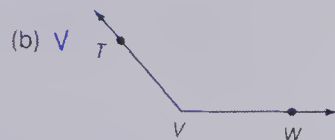
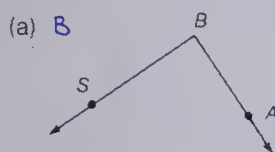
---

 $48\ 534$

15. Name each shape.



16. Name the vertex of each angle.



17. Draw a circle with the radius  $AB$ .



18. Draw a cylinder.



## OBJECTIVE

To review and test selected concepts and skills previously covered

## PACING

Level A All  
Level B All  
Level C All

## USING THE BOOK

This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a large number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic or, refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1, 2	17
3-8	28
9-10, 12, 13	12, 16
11, 14	21
15	37
16	41
17	42
18	60

# CHAPTER 3 OVERVIEW

This chapter develops and extends skills related to multiplication of whole numbers and decimals. Emphasis is placed on understanding of, and efficiency with, the formal multiplication algorithm. Number patterns are used frequently to develop various concepts such as placement of the decimal point. Problem solving is also given regular emphasis throughout the chapter.

## OBJECTIVES

- A To multiply by powers of 10
- B To multiply by multiples of 10, 100, and 1000
- C To multiply up to a 5-digit factor by a 1-digit factor
- D To multiply 2- and 3-digit factors by 2- and 3-digit factors
- E To multiply a decimal by a whole number
- F To multiply a whole number by a decimal
- G To multiply a decimal by a decimal
- H To solve word problems

## BACKGROUND

Multiplication can be regarded as repeated addition. This can be demonstrated through the use of arrays.

$$3 \times 4 \quad \begin{array}{c} 4 \\ 3 \left[ \begin{array}{ccc} \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet \end{array} \right] \end{array} \quad 4 + 4 + 4 \text{ or } 3 \text{ groups of } 4$$

An array can also effectively demonstrate the multiplication process when the multiplicand is greater than one digit. The distributive property permits us to "distribute" or "break apart" the number into its component place-value parts, multiply separately, and add the partial products to find the final product.

$$3 \times 12 \quad \begin{array}{c} 10 \quad 2 \\ 3 \left[ \begin{array}{ccc} \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet \end{array} \right] \end{array} \quad \begin{array}{l} 3 \times 10 \\ \text{plus} \\ 3 \times 2 \end{array}$$

The array can lead to various multiplication algorithms which help to promote understanding of the process.

$$3 \times 12 \text{ (a) Expanded Form} \quad \begin{array}{r} 10 + 2 \\ \times \quad 3 \\ \hline 30 + 6 = 36 \end{array}$$

$$\text{(b) Column Form} \quad \begin{array}{r} 12 \\ \times 3 \\ \hline 6 \quad (3 \times 2) \\ 30 \quad (3 \times 10) \\ \hline 36 \end{array}$$

This leads to the Short Form or the standard multiplication algorithm.

$$\begin{array}{r} 12 \\ \times 3 \\ \hline 36 \end{array}$$

Some students may have difficulty with multiplication for one or more of the following reasons:

- (a) insufficient knowledge of, and competence with, basic multiplication facts;
- (b) insufficient understanding of multiplication as repeated addition. This difficulty is most evident in problem-solving situations. A student, when asked to find the total number of cans of pop contained in 5 cases of 24 cans, may not perceive this as a repeated addition situation (i.e., 5 groups of 24), and therefore requiring multiplication.
- (c) inability to estimate and relate an estimate to the calculated product;
- (d) insufficient knowledge of the steps in the multiplication algorithm including place value as it relates to regrouping and placement of the partial products.

Time spent developing an understanding of the multiplication process through concrete experiences and an on-going drill program will pay dividends.

## MATERIALS

graph paper

## CAREER AWARENESS

### Dockyard Workers [90]

An efficient dockyard requires the cooperation and skill of many kinds of workers. Tug boat operators often have to tow a large ship into the dockyard and nudge it safely against the dock. Crane operators and workers must unload the ship. Drivers, using various kinds of machines like tow motors, pick up the cargo and place it neatly in nearby warehouses or load it onto waiting trucks. Managers are responsible for coordinating the loading and unloading, and shippers ensure that the proper cargos are sent to the correct destinations.

Most dockyards have repair facilities where damaged ship equipment can be overhauled or replaced. A dockyard can be an extremely busy place!

## Tune Up

1. (a)  $\begin{array}{r} 5 \\ \times 4 \\ \hline 20 \end{array}$  (b)  $\begin{array}{r} 3 \\ \times 3 \\ \hline 9 \end{array}$  (c)  $\begin{array}{r} 9 \\ \times 1 \\ \hline 9 \end{array}$  (d)  $\begin{array}{r} 0 \\ \times 4 \\ \hline 0 \end{array}$  (e)  $\begin{array}{r} 8 \\ \times 2 \\ \hline 16 \end{array}$  (f)  $\begin{array}{r} 10 \\ \times 3 \\ \hline 30 \end{array}$
2. (a)  $\begin{array}{r} 6 \\ \times 6 \\ \hline 36 \end{array}$  (b)  $\begin{array}{r} 4 \\ \times 9 \\ \hline 36 \end{array}$  (c)  $\begin{array}{r} 1 \\ \times 5 \\ \hline 5 \end{array}$  (d)  $\begin{array}{r} 8 \\ \times 7 \\ \hline 56 \end{array}$  (e)  $\begin{array}{r} 6 \\ \times 4 \\ \hline 24 \end{array}$  (f)  $\begin{array}{r} 7 \\ \times 2 \\ \hline 14 \end{array}$
3. (a)  $\begin{array}{r} 8 \\ \times 8 \\ \hline 64 \end{array}$  (b)  $\begin{array}{r} 10 \\ \times 7 \\ \hline 70 \end{array}$  (c)  $\begin{array}{r} 5 \\ \times 9 \\ \hline 45 \end{array}$  (d)  $\begin{array}{r} 7 \\ \times 7 \\ \hline 49 \end{array}$  (e)  $\begin{array}{r} 10 \\ \times 2 \\ \hline 20 \end{array}$  (f)  $\begin{array}{r} 4 \\ \times 8 \\ \hline 32 \end{array}$
4. (a)  $\begin{array}{r} 7 \\ \times 6 \\ \hline 42 \end{array}$  (b)  $\begin{array}{r} 6 \\ \times 2 \\ \hline 12 \end{array}$  (c)  $\begin{array}{r} 10 \\ \times 10 \\ \hline 100 \end{array}$  (d)  $\begin{array}{r} 5 \\ \times 6 \\ \hline 30 \end{array}$  (e)  $\begin{array}{r} 7 \\ \times 3 \\ \hline 21 \end{array}$  (f)  $\begin{array}{r} 9 \\ \times 9 \\ \hline 81 \end{array}$
5. (a)  $\begin{array}{r} 8 \\ \times 5 \\ \hline 40 \end{array}$  (b)  $\begin{array}{r} 4 \\ \times 2 \\ \hline 8 \end{array}$  (c)  $\begin{array}{r} 5 \\ \times 5 \\ \hline 25 \end{array}$  (d)  $\begin{array}{r} 8 \\ \times 9 \\ \hline 72 \end{array}$  (e)  $\begin{array}{r} 9 \\ \times 6 \\ \hline 54 \end{array}$  (f)  $\begin{array}{r} 1 \\ \times 1 \\ \hline 1 \end{array}$
6. (a)  $\begin{array}{r} 8 \\ \times 6 \\ \hline 48 \end{array}$  (b)  $\begin{array}{r} 5 \\ \times 3 \\ \hline 15 \end{array}$  (c)  $\begin{array}{r} 4 \\ \times 4 \\ \hline 16 \end{array}$  (d)  $\begin{array}{r} 6 \\ \times 1 \\ \hline 6 \end{array}$  (e)  $\begin{array}{r} 10 \\ \times 5 \\ \hline 50 \end{array}$  (f)  $\begin{array}{r} 3 \\ \times 9 \\ \hline 27 \end{array}$
7. (a)  $\begin{array}{r} 7 \\ \times 5 \\ \hline 35 \end{array}$  (b)  $\begin{array}{r} 2 \\ \times 2 \\ \hline 4 \end{array}$  (c)  $\begin{array}{r} 10 \\ \times 8 \\ \hline 80 \end{array}$  (d)  $\begin{array}{r} 8 \\ \times 0 \\ \hline 0 \end{array}$  (e)  $\begin{array}{r} 9 \\ \times 7 \\ \hline 63 \end{array}$  (f)  $\begin{array}{r} 4 \\ \times 3 \\ \hline 12 \end{array}$
8. (a)  $\begin{array}{r} 6 \\ \times 10 \\ \hline 60 \end{array}$  (b)  $\begin{array}{r} 9 \\ \times 2 \\ \hline 18 \end{array}$  (c)  $\begin{array}{r} 6 \\ \times 3 \\ \hline 18 \end{array}$  (d)  $\begin{array}{r} 10 \\ \times 4 \\ \hline 40 \end{array}$  (e)  $\begin{array}{r} 3 \\ \times 8 \\ \hline 24 \end{array}$  (f)  $\begin{array}{r} 7 \\ \times 4 \\ \hline 28 \end{array}$



Tune Up Score Card	
Points	Fitness Report
48 - 43	Excellent condition
42 - 38	Very good condition
37 - 33	Good condition
32 - 28	Fair condition
27 - less	More exercise



1 mark for each correct answer.  
How was your Fitness Report?

## OBJECTIVE

To practise basic multiplication facts

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

BFA COMP LAB II — 29-30.

BFA PROB. SOLVING LAB II — 49, 53.

## USING THE BOOK

This drill page could be done at one sitting. To encourage greater student involvement, you might consider having each pupil predict what score they will achieve on the set of questions, and hence, what their "Fitness Report" will be. You may wish to either (a) do this page (or parts of it) orally, or (b) use it as a basis for some oral drill on multiplication facts.

Drill multiplication 69

## ACTIVITIES

1. Some students might benefit from completing a multiplication grid like the one shown. Until they gain mastery of the basic facts, students might use the grid as a reference with other suggested multiplication activities.

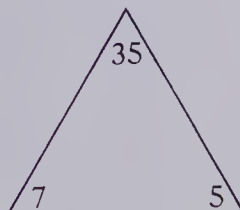
×	1	2	3	10
1				
2				
3				
4				
10				

### Example

×	7	2	4	1	3
5					
3					
6					
8					
4					

3. Construct triangular flash cards for extra oral and written multiplication drill.

### Example



When using the cards, place your hand over the product (35). The card then can be used to show:

$$7 \times 5 = \blacksquare \quad 5 \times 7 = \blacksquare$$

This reinforces the fact that multiplication is commutative (i.e., changing the order of the factors does not affect the product).

4. Use chain calculations for both oral and written drill in order to reinforce combined operations.

### Example

Oral: Multiply 6 by 4. Add 5.

Subtract 3. Add 2.

Written:  $6 \times 4 + 5 - 3 + 2$  [28]

2. Provide, or have students create, Multiplication Mini-Grids.



## OBJECTIVES

To introduce multiplication when one of the factors is 1, 10, 100, or 1000  
To develop and apply a rule based on the pattern that exists between these factors and the products

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

factor(s), product

## RELATED AIDS

HMS — DM16 and DM17.  
BFA COMP LAB II — 36.

## SUGGESTIONS

**Initial Activity** Write the following questions on the chalkboard. Have students provide the missing products.

$4 \times 1 = \square$        $36 \times 1 = \square$   
 $4 \times 10 = \square$        $36 \times 10 = \square$   
 $4 \times 100 = \square$        $36 \times 100 = \square$   
 $4 \times 1000 = \square$        $36 \times 1000 = \square$

If a calculator is available, one student might check the products.

Discuss the patterns that develop in the products. Encourage students to express orally the relationship that exists between the number of zeros in the second factor and the number of zeros in the product. Develop a rule cooperatively.

Avoid suggesting that zeros are "added" to the product; in reality, the zeros are "annexed".

$6 \times 1000 \neq 6 + 0 + 0 + 0$  (or 6)

You may want to take this opportunity to remind students that multiplication is based on repeated addition. This may help some students to better understand how the pattern develops.

**Examples**

$4 \times 1 = 1$	$4 \times 10 = 10$	$4 \times 100 = 100$
1	10	100
1	10	100
1	10	100
4	40	400

## USING THE BOOK

Use the pupil display to reinforce the discoveries made in the Initial Activity. You might wish to work with students on Exercises 1 and 2 to ensure that the rule is being properly applied. Point out that Exercises 6, 21, and 22 are slightly different than the rest of the exercises and will require careful attention. [The first factor contains one or more zeros.]

## Special Factors

5	$\times$	10	=	50
factor		factor		product

Kim made these patterns. The second factors are 1, 10, 100, or 1000.

$3 \times 1 = 3$	$25 \times 1 = 25$	$376 \times 1 = 376$
$3 \times 10 = 30$	$25 \times 10 = 250$	$376 \times 10 = 3760$
$3 \times 100 = 300$	$25 \times 100 = 2500$	$376 \times 100 = 37600$
$3 \times 1000 = 3000$	$25 \times 1000 = 25000$	$376 \times 1000 = 376000$

Can you find the pattern?

What rule helps you find the product when multiplying by 1, 10, 100, or 1000?

### Exercises

Use your rule to complete this electronic "special-factor" chart.

	$\times$	1	10	100	1000
1.	7	7	70	700	7000
2.	34	34	340	3400	34000
3.	156	156	1560	15600	156000
4.	18	18	180	1800	18000
5.	3	3	30	300	3000
★ 6.	50	50	500	5000	50000

Write each product.

- |                                   |                                       |                                     |                                     |
|-----------------------------------|---------------------------------------|-------------------------------------|-------------------------------------|
| ● 39 $\times$ 100 <b>3900</b>     | 8. 17 $\times$ 1 <b>17</b>            | 9. 8 $\times$ 1000 <b>8000</b>      | 10. 126 $\times$ 10 <b>1260</b>     |
| 11. 852 $\times$ 100 <b>85200</b> | 12. 3 $\times$ 100 <b>300</b>         | 13. 87 $\times$ 1000 <b>87000</b>   | 14. 11 $\times$ 100 <b>1100</b>     |
| 15. 28 $\times$ 1 <b>28</b>       | 16. 742 $\times$ 1000 <b>742000</b>   | 17. 389 $\times$ 100 <b>38900</b>   | 18. 999 $\times$ 10 <b>9990</b>     |
| ★ 19. 6 $\times$ 1000 <b>6000</b> | ★ 20. 14 $\times$ 10000 <b>140000</b> | ★ 21. 40 $\times$ 1000 <b>40000</b> | ★ 22. 100 $\times$ 100 <b>10000</b> |

70 Multiplication by 1 10 100 1000

Note that the exercises are designed to be done mentally with reliance on the developed rule rather than on a formal algorithm. The rule becomes important as students deal with expanded notation on page 72.

## ACTIVITIES

- Play the game "22" for two to four players.
  - Using a blank die, place the numbers 1, 10, 10, 100, 100, and 1000 on the faces.
  - The first player rolls the die and multiplies 22 by the number showing on the up-turned face of the die (e.g.,  $22 \times 100 = 2200$ ).
  - Play continues for the rest of the students. This completes one round.
  - Play 5 rounds. The player with the greatest total score wins.

Player 1	Player 2
220	220
2200	22
22	220
220	220
+2200	+2200
4862	2882

Player 1 wins.

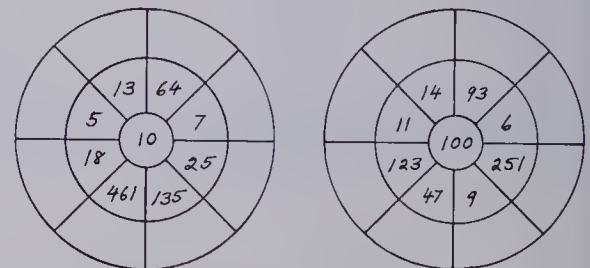
**Variations:** Choose any other number for the game, e.g., 47 or 125. The player with the *least* score wins.

- Play "Concentration" using 8 pairs of matching cards.

$23 \times 100$  matches **2300**

$16 \times 10$  matches **160**

- Provide, or have students create, drill wheels for extra practice.



# Patterns with Multiples of 10

Investigate these pattern boards.

Can you find the patterns?

$2 \times 4$	$= 8$
$2 \times 40$	$= 80$
$2 \times 400$	$= 800$
$2 \times 4000$	$= 8000$

$3 \times 5$	$= 15$
$3 \times 50$	$= 150$
$3 \times 500$	$= 1500$
$3 \times 5000$	$= 15\ 000$

What rule helps you find the number of zeros in each product?

## Exercises

Use your rule to find the products.

1. (a)  $2 \times 3$  **6** (b)  $2 \times 30$  **60** (c)  $2 \times 300$  **600** (d)  $2 \times 3000$  **6000**  
 2. (a)  $4 \times 4$  **16** (b)  $40 \times 4$  **160** (c)  $400 \times 4$  **1600** (d)  $4000 \times 4$  **16000**  
 3. (a)  $6 \times 7$  **42** (b)  $6 \times 70$  **420** (c)  $6 \times 700$  **4200** (d)  $6 \times 7000$  **42000**

Write each product.

4.  $40 \times 2$  **80** 5.  $60 \times 3$  **180** 6.  $70 \times 8$  **560** 7.  $90 \times 5$  **450** 8.  $30 \times 9$  **270** 9.  $50 \times 4$  **200**  
 10.  $200 \times 4$  **800** 11.  $200 \times 6$  **1200** 12.  $600 \times 3$  **1800** 13.  $400 \times 6$  **2400** 14.  $800 \times 5$  **4000** 15.  $600 \times 8$  **4800**  
 16.  $2000 \times 3$  **6000** 17.  $4000 \times 8$  **32000** 18.  $7000 \times 3$  **21000** 19.  $9000 \times 9$  **81000**

Solve these mini-stories.

20. About 3 airplanes land and take off every minute at the International Airport. About how many would land and take off in  
 (a) 20 min? **60** (b) 50 min? **150** (c) 70 min? **210** (d) 100 min? **300**  
 21. About 400 airplanes land and take off every day at another airport. About how many would land and take off in  
 (a) 6 d? **2400** (b) 5 d? **2000** (c) 8 d? **3200** (d) 2 d? **800**

Multiplication by multiples of 10, 100, 1000 71

## OBJECTIVES

- To introduce multiplication when one of the factors is a multiple of 10, 100, or 1000  
 To develop and apply a rule based on the pattern that exists between these factors and the products

## PACING

- Level A All  
 Level B All  
 Level C All

## SUGGESTIONS

**Initial Activity** Use the pupil display (or similar chalkboard examples) as a means for discussing the patterns. Encourage students to draw upon conclusions reached on the preceding page (page 70). Avoid the phrase "zeros are added to the product", but say rather "zeros are annexed".

Many students will develop a rule similar to this one.

*Example*

$2 \times 4000$   
 Multiply the 4 by the 2, and annex three zeros.

$$2 \times 4000 = 8000$$

You may want to explore the mathematics behind the rule in more depth.

*Example*

$2 \times 4000$   
 We can think of 4000 as  $4 \times 1000$ .  
 Now we can write:

$$\begin{aligned} &2 \times 4 \times 1000 \\ &= 8 \times 1000 \\ &= 8000 \end{aligned}$$

## USING THE BOOK

Students should be aware that they need only apply their rule mentally and record the product rather than calculate the product using a formal algorithm. The skills developed on this page have implications for understanding the work on expanded multiplicands on pages 73, 74, and 75; and they play an important part in the estimation skills on page 76.

Be certain that the pupils are familiar with the accepted answer format. You may wish to review the meaning of the symbols for minute and day (i.e., min and d) to facilitate the solutions for Exercises 20 and 21.

a	5	b	6
c	5		4

ACROSS DOWN  
 a  $7 \times 8$  a  $5 \times 11$   
 c  $6 \times 9$  b  $8 \times 8$

## ACTIVITIES

1. Students might benefit from exploring number patterns where *both* factors are multiples of 10.

*Example*

$$20 \times 40 = 800$$

The basis for the pattern can be shown by using the associative (grouping) property.

$$\begin{aligned} 20 \times 40 &= (2 \times 10) \times (4 \times 10) \\ &= (2 \times 4) \times (10 \times 10) \text{ (associative)} \\ &= 8 \times 100 \text{ (property)} \\ &= 800 \end{aligned}$$

An algorithm approach can also be used.

$$\begin{array}{rcl} 40 & \longrightarrow & 4 \times 10 \\ \times 20 & \longrightarrow & 2 \times 10 \\ \hline & & 8 \times 100 = 800 \end{array}$$

2. Provide, or have students create, appropriate function tables for extra practice.

- (a) Complete by using the rule.

Rule: $\times 8$	
Enter	Display
20	160
50	■
400	■
900	■
6000	■
3000	■

[400]  
 [3200]  
 [7200]  
 [48 000]  
 [24 000]

- (b) Find the rule, then complete.

Rule: ?	
Enter	Display
60	240
20	80
300	1200
50	■
800	■
7000	■
600	■

[200]  
 [3200]  
 [28 000]  
 [2400]

[Rule:  $\times 4$ ]

3. Have students create simple crossnumber puzzles to maintain competency with basic facts. The puzzles are self-checking.



## OBJECTIVE

To introduce expanded notation using numbers having not more than four digits

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

expanded form

## SUGGESTIONS

**Initial Activity** You may wish to briefly review place-value concepts before beginning this lesson. For example, the digit 6 in the number 462 has a value of 60 because the digit represents 6 tens ( $6 \times 10$ ). This leads nicely to the idea that the value of any digit can be expressed as that digit multiplied by the appropriate power of 10. Use the pupil display as an example of this idea.

Use examples on the chalkboard that illustrate translation from a number to expanded form and vice versa.

(a)  $324 = (3 \times 100) + (2 \times 10) + (4 \times 1)$

(b)  $(5 \times 100) + (0 \times 10) + (8 \times 1) = 508$

The ability to view a number in expanded form has important implications for the work appearing on page 73.

## USING THE BOOK

Explain to the students that the machine pictured at the top of the pupil page simply breaks numbers into their place-value parts. Be sure they see the relationship between the input of 4673 and the output (i.e., the expanded form:  $4000 + 600 + 70 + 3$ ).

Exercises 1 and 25 have already been completed. These and Exercises 2, 3, 17, and 18 (the answers for which are at the back of the student's book) can be used as a guide to the answer format.

You may want to use Exercises 25 to 33 as an oral drill, then assign Exercises 2 to 24 for independent work.

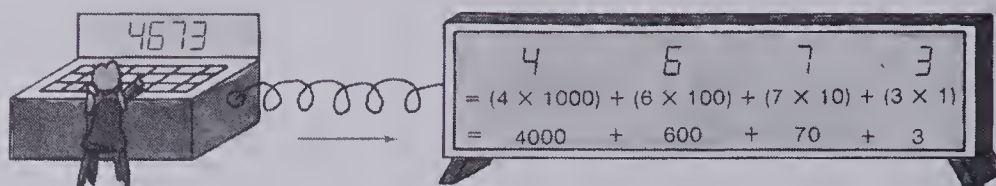
## ACTIVITIES

Some students might benefit from constructing number cards as described.

- (i) 9 cards (5 cm by 5 cm) using the numbers 1, 2, 3, ..., 9
- (ii) 9 cards (10 cm by 5 cm) using the numbers 10, 20, 30, ..., 90

## The Expansion Machine

Dr. Morrow has just invented an expansion machine.



The machine writes numbers in expanded form.

### Exercises

Write these numbers in expanded form.

1.  $2708 \rightarrow 2708 = (2 \times 1000) + (7 \times 100) + (0 \times 10) + (8 \times 1)$   
 $= 2000 + 700 + 0 + 8$

2. 8241

3. 6504

4. 259

5. 3218

6. 47

7. 7526

8. 9047

9. 830

10. 2606

11. 8174

12. 152

13. 7634

14. 6053

15. 3030

16. 5555

Write each as a numeral.

17.  $(4 \times 1000) + (7 \times 100) + (6 \times 10) + (2 \times 1)$  4762

18.  $3000 + 500 + 0 + 9$  3509

19.  $600 + 30 + 4$  634

20.  $(7 \times 100) + (2 \times 10) + (0 \times 1)$  720

21.  $(3 \times 1000) + (8 \times 100) + (0 \times 10) + 5$  3805

22.  $9000 + 0 + 50 + 6$  9056

23.  $(7 \times 10) + (3 \times 1)$  73

24.  $5000 + 700 + 70 + 0$  5770

Write the expanded form for each underlined digit.

25.  $4\text{6}25 \rightarrow (6 \times 100) = 600$  (3 x 1) = 3

26.  $52\text{3}$  (8 x 1000) = 8000 (0 x 10) = 0

27.  $5\text{7}28 \rightarrow (5 \times 1000) = 5000$  (2 x 100) = 200 (0 x 1) = 0

28.  $87\text{2}$  (1 x 100) = 100 (9 x 100) = 900

29.  $5\text{7}28$

30.  $2\text{9}4$

31.  $57\text{0}$

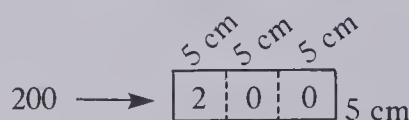
32.  $71\text{4}6$

33.  $49\text{1}2$

72 Expanded notation

(iii) 9 cards (15 cm by 5 cm) using the numbers 100, 200, 300, ..., 900

(iv) 9 cards (20 cm by 5 cm) using the numbers 1000, 2000, 3000, ..., 9000  
Each digit should be carefully written within a 5 cm  $\times$  5 cm space.

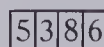
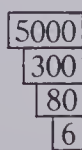


The cards can be used to show any number from 1 to 9999 in expanded or regular form.

**Example**

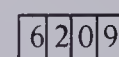
Expanded Form

Regular Form



Students who require extra practice can use these cards to review place-value skills.

(a) Use the cards to build the number 6209.



(b) Show this number in expanded form: 7045.



(c) Use the cards to make the number 489, then show it in expanded form.



(d) Find the card that represents the value of the underlined digit in 6251.



(e) These cards are mixed up. Rearrange them to make the number.



[5326]



# Marching Bands

How many musicians in the marching band?

The Fenton City Marching Band



23 musicians in each row

We can use.

Expanded form

Think of 23 as  $20 + 3$ .

$$\begin{array}{r} 20 + 3 \\ \times \quad 6 \\ \hline 120 + 18 = 138 \end{array}$$

Column form

$$\begin{array}{r} 23 \\ \times 6 \\ \hline 18 \rightarrow (6 \times 3) \\ 120 \rightarrow (6 \times 20) \\ \hline 138 \end{array}$$

We can use the *short form*.

Step 1  $\leftarrow$  Write 1 here meaning 1 ten

$$\begin{array}{r} 23 \\ \times 6 \quad (6 \times 3 = 18) \\ \hline 8 \text{ Write 8} \end{array}$$

Step 2

$$\begin{array}{r} 23 \\ \times 6 \quad (6 \times 2 \text{ tens} = 12 \text{ tens}) \\ \hline 138 \end{array}$$

Add 1 ten.  $\rightarrow$  1 ten  
Write 13      13 tens

There are 138 musicians in the marching band.

## Exercises

Multiply.

1. $\begin{array}{r} 35 \\ \times 7 \\ \hline 245 \end{array}$	2. $\begin{array}{r} 46 \\ \times 3 \\ \hline 138 \end{array}$	3. $\begin{array}{r} 50 \\ \times 9 \\ \hline 450 \end{array}$	4. $\begin{array}{r} 38 \\ \times 5 \\ \hline 190 \end{array}$	5. $\begin{array}{r} 68 \\ \times 6 \\ \hline 408 \end{array}$	6. $\begin{array}{r} 29 \\ \times 9 \\ \hline 261 \end{array}$
7. $\begin{array}{r} 18 \\ \times 3 \\ \hline 54 \end{array}$	8. $\begin{array}{r} 70 \\ \times 6 \\ \hline 420 \end{array}$	9. $\begin{array}{r} 86 \\ \times 2 \\ \hline 172 \end{array}$	10. $\begin{array}{r} 25 \\ \times 5 \\ \hline 125 \end{array}$	11. $\begin{array}{r} 30 \\ \times 8 \\ \hline 240 \end{array}$	12. $\begin{array}{r} 44 \\ \times 7 \\ \hline 308 \end{array}$

Multiplication algorithm: 2-digit factor by 1-digit factor 73

## OBJECTIVE

To develop the Short Form algorithm for multiplication of a 2-digit factor by a 1-digit factor

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

graph paper

## RELATED AIDS

BFA COMP LAB II — 32, 33.  
BFA PROB. SOLVING LAB II — 61.

## BACKGROUND

As noted in the Chapter Overview, the formal multiplication algorithm is based on the distributive property. This property permits a multiplicand of two or more digits to be "distributed" or "broken apart" into its component place-value parts. Thus, as noted in the pupil display, the multiplicand 23 is thought of as  $20 + 3$ . Each part is multiplied by the multiplier (e.g., 6), and the sum of the partial products provides the final product.

It is not intended that students should memorize the distributive property, but rather that they should have some understanding of its application to the multiplication algorithm. In other words, it is important that students not only understand "what" they are doing in terms of the algorithm, but also "why" it works.

## ACTIVITIES

1. Provide, or have students create, mini-stories using marching bands as a theme (or have students create their own themes).

*Examples*

- Greenville Marching Band. 8 rows. 32 musicians in each row. How many players altogether? [256]
- Fillmore Marching Band. 9 rows. 45 musicians in each row. How many players altogether? [405]

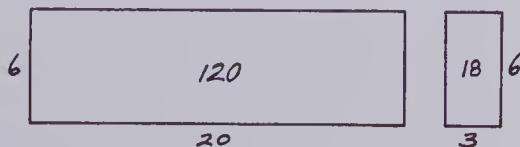
2. Some students would benefit from oral or written drill that approximates the addition of the regrouped number to the basic multiplication fact.

*Examples*

- $6 \times 4 + 3$
- $7 \times 3 + 5$
- $8 \times 7 + 1$
- $2 \times 9 + 4$

This highlights the basic steps required in the algorithm.

$$\begin{array}{r} 23 \\ \times 6 \\ \hline 18 \quad (6 \times 3) \\ 120 \quad (6 \times 20) \\ \hline 138 \end{array}$$



4. Finally, the model provides a basis for understanding the Short Form, or formal, algorithm as illustrated in the pupil display.

## USING THE BOOK

You might want to assure students that all the data to the right of the algorithm are there simply for explanation. The data are not intended to be part of the written algorithm. Also, students should be allowed initially to record the "regrouped" digits above the multiplicand. However, students should be encouraged to deal with regrouping mentally as soon as possible.

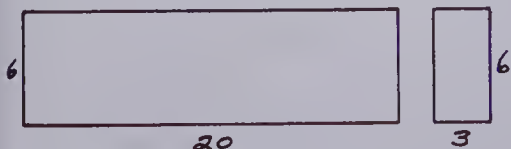
## SUGGESTIONS

**Initial Activity** In order to develop understanding, it would be appropriate to spend some time investigating the semiconcrete model of the Fenton City Marching Band in the pupil display (or work with a similar model drawn on graph paper).

1. The model shows that multiplication is essentially repeated addition. In this case, there are 6 addends of 23.

23 \*\*\*\*\*  
23 \*\*\*\*\*  
23 \*\*\*\*\*  
23 \*\*\*\*\*  
23 \*\*\*\*\*  
23 \*\*\*\*\*

2. The model can be used to show one of the basic characteristics of the multiplication algorithm — the expansion of the multiplicand. The number 23 is expanded to show  $20 + 3$ .



3. The same model can be used to show the parts of the Column Form.

## OBJECTIVE

To develop the Short Form algorithm for multiplication of a 3-digit factor by a 1-digit factor

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

BFA COMP LAB II — 35.  
BFA PROB. SOLVING LAB II — 69.

## SUGGESTIONS

**Initial Activity** It might be appropriate to briefly demonstrate on the chalkboard the three model forms as they apply to a 3-digit multiplicand. For example,

Addition Form	Expanded Form
$\begin{array}{r} 368 \\ 368 \\ 368 \\ 368 \\ \hline 1472 \end{array}$	$\begin{array}{r} 300 + 60 + 8 \\ \times \quad 4 \\ \hline 1200 + 240 + 32 \\ = 1472 \end{array}$

### Column Form

$$\begin{array}{r} 368 \\ \times 4 \\ \hline 32 \quad (4 \times 8) \\ 240 \quad (4 \times 60) \\ 1200 \quad (4 \times 300) \\ \hline 1472 \end{array}$$

This should promote further understanding and demonstrate that these models are entirely consistent with those on page 73. However, if you feel that this demonstration might detract from the Short Form algorithm, omit this suggestion.

If you intend to use chalkboard examples of the Short Form, you might include examples of Exercises 6 and 7 (zero in the one's place) and Exercises 9 and 10 (zero in the ten's place).

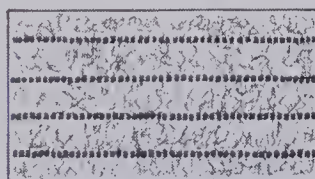
## USING THE BOOK

As the class works on the exercises, identify those students who are having difficulty. Try to determine the cause of the difficulty: weakness with place value, insufficient knowledge of basic multiplication facts, and/or lack of understanding of the multiplication algorithm. These students might benefit from a review of the Expanded and Column Forms of the algorithm.

**Example**

$$4 \times 368$$

## Micro Cells



4 rows of cells

368 cells in each row

We can use the *short form*.

**Step 1**

$$\begin{array}{r} 368 \\ \times 4 \quad (4 \times 8 = 32 \text{ ones}) \\ \hline 2 \end{array}$$

Write 2 here, meaning 2 tens

**Step 3**

$$\begin{array}{r} 368 \quad (4 \times 3 \text{ hundreds} = 12 \text{ hundreds}) \\ \times 4 \quad \text{Add } 2 \text{ hundreds} \\ \hline 1472 \end{array}$$

Write 14 here, meaning 14 hundreds

Conrad makes micro cells in the Benton Laboratory.  
How many micro cells did Conrad make altogether?

$$\begin{array}{r} \text{Find } 368 \\ \times 4 \\ \hline \end{array}$$

**Step 2**

$$\begin{array}{r} 368 \\ \times 4 \quad (4 \times 6 \text{ tens} = 24 \text{ tens}) \\ \hline 72 \end{array}$$

Add 3 tens

Write 27 here, meaning 27 tens

Conrad made 1472 micro cells altogether.

### Exercises

Multiply. Use the short form.

1. $\begin{array}{r} 427 \\ \times 6 \\ \hline 2562 \end{array}$	2. $\begin{array}{r} 723 \\ \times 8 \\ \hline 5784 \end{array}$	3. $\begin{array}{r} 175 \\ \times 5 \\ \hline 875 \end{array}$	4. $\begin{array}{r} 283 \\ \times 7 \\ \hline 1981 \end{array}$	5. $\begin{array}{r} 393 \\ \times 4 \\ \hline 1572 \end{array}$
6. $\begin{array}{r} 510 \\ \times 8 \\ \hline 4080 \end{array}$	7. $\begin{array}{r} 930 \\ \times 5 \\ \hline 4650 \end{array}$	8. $\begin{array}{r} 415 \\ \times 9 \\ \hline 3735 \end{array}$	9. $\begin{array}{r} 707 \\ \times 5 \\ \hline 3535 \end{array}$	10. $\begin{array}{r} 408 \\ \times 3 \\ \hline 1224 \end{array}$
11. $\begin{array}{r} 924 \\ \times 7 \\ \hline 6468 \end{array}$	12. $\begin{array}{r} 9109 \\ \times 4 \\ \hline 36436 \end{array}$	13. $\begin{array}{r} 9109 \\ \times 5 \\ \hline 45545 \end{array}$	14. $\begin{array}{r} 9109 \\ \times 6 \\ \hline 54654 \end{array}$	15. $\begin{array}{r} 9109 \\ \times 7 \\ \hline 63763 \end{array}$

Solve.

16. 9 rows of cells  
543 cells in each row.  
How many cells altogether? **4887**

17. 7 rows of cells  
684 cells in each row.  
How many cells altogether? **4788**

74 Multiplication of 3-digit factors by 1-digit factor

### Expanded Form

$$\begin{array}{r} 300 + 60 + 8 \\ \times \quad 4 \\ \hline 1200 + 240 + 32 \\ = 1472 \end{array}$$

### Column Form

$$\begin{array}{r} 368 \\ \times 4 \\ \hline 32 \quad (4 \times 8) \\ 240 \quad (4 \times 60) \\ 1200 \quad (4 \times 300) \\ \hline 1472 \end{array}$$

Have those students completing Exercises 12 to 15 investigate the patterns that develop.

## ACTIVITIES

1. Provide, or have students create, mini-stories using micro cells as a theme (or a theme of interest to the students).

**Examples**

(a) 9 rows of cells. 543 cells in each row. How many cells altogether? [4887]

(b) 7 rows of cells. 684 cells in each row. How many cells altogether? [4788]

2. Some students might enjoy extending the patterns produced in Exercises 12 to 15. Encourage these students to predict the products, then check by multiplying.

$\begin{array}{r} 9109 \\ \times 2 \\ \hline [18 \ 218] \end{array}$	$\begin{array}{r} 9109 \\ \times 3 \\ \hline [27 \ 327] \end{array}$	$\begin{array}{r} 9109 \\ \times 4 \\ \hline [36 \ 436] \end{array}$	$\dots$	$\begin{array}{r} 9109 \\ \times 9 \\ \hline [81 \ 981] \end{array}$
--	--	--	---------	--

3. Other students might enjoy exploring "Stubborn Numbers". Choose any 2-digit number. Multiply one digit by the other to produce another number. Continue the process until a 1-digit number is produced.

**Example**  $34 \rightarrow 12 \rightarrow 2$   
(3 × 4) (1 × 2)

Count the number of arrows. This gives the "stubbornness factor" (SF) or degree of stubbornness of the original number. The SF of 34 is 2. Try other 2-digit numbers and find the SF of each.

**Example**

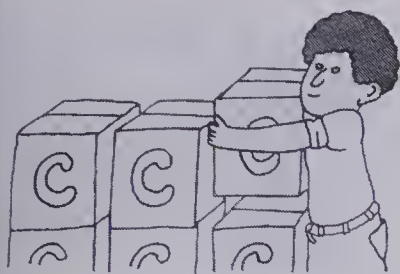
$77 \rightarrow 49 \rightarrow 36 \rightarrow 18 \rightarrow 8$  [SF = 4]

Try 3-digit numbers.

**Example**

$136 \rightarrow 18 \rightarrow 8$  [SF = 2]  
(1 × 3 × 6)





## Crivets

Kami makes crivets for the Fielding Company.

6 cases of crivets.  
4786 crivets in each case  
How many crivets altogether?

Find  $4786 \times 6$

Can you explain each step?

Step 1	Step 2	Step 3	Step 4
$\begin{array}{r} 4786 \\ \times 6 \\ \hline 6 \end{array}$	$\begin{array}{r} 4786 \\ \times 6 \\ \hline 16 \end{array}$	$\begin{array}{r} 4786 \\ \times 6 \\ \hline 716 \end{array}$	$\begin{array}{r} 4786 \\ \times 6 \\ \hline 28716 \end{array}$

There are 28 716 crivets altogether

### Exercises

Multiply.

$\begin{array}{r} 5376 \\ \times 4 \\ \hline 21504 \\ 4204 \\ \hline 21504 \end{array}$	$\begin{array}{r} 4875 \\ \times 5 \\ \hline 24375 \\ 9064 \\ \hline 24375 \end{array}$	3. $\begin{array}{r} 2183 \\ \times 8 \\ \hline 17464 \\ 6423 \\ \hline 17464 \end{array}$	4. $\begin{array}{r} 3657 \\ \times 6 \\ \hline 21942 \\ 4738 \\ \hline 21942 \end{array}$
$\begin{array}{r} 37148 \\ \times 6 \\ \hline 222888 \\ 70346 \\ \hline 222888 \end{array}$	$\begin{array}{r} 62475 \\ \times 5 \\ \hline 312375 \\ 16807 \\ \hline 312375 \end{array}$	11. $\begin{array}{r} 54917 \\ \times 3 \\ \hline 164751 \\ 29366 \\ \hline 164751 \end{array}$	12. $\begin{array}{r} 42856 \\ \times 8 \\ \hline 342848 \\ 85623 \\ \hline 342848 \end{array}$
$\begin{array}{r} 140692 \\ \times 2 \\ \hline 140692 \end{array}$	$\begin{array}{r} 117649 \\ \times 7 \\ \hline 117649 \end{array}$	15. $\begin{array}{r} 164751 \\ \times 4 \\ \hline 117464 \\ 29366 \\ \hline 117464 \end{array}$	16. $\begin{array}{r} 342848 \\ \times 9 \\ \hline 170607 \\ 85623 \\ \hline 170607 \end{array}$
★17. $\begin{array}{r} 999999 \\ \times 3 \\ \hline 2999997 \end{array}$	★18. $\begin{array}{r} 999999 \\ \times 4 \\ \hline 3999996 \end{array}$	★19. $\begin{array}{r} 999999 \\ \times 5 \\ \hline 4999995 \end{array}$	★20. $\begin{array}{r} 999999 \\ \times 6 \\ \hline 5999994 \end{array}$

Multiplication of 4-, 5-, and 6-digit factors by a 1-digit factor 75

## OBJECTIVE

To develop the Short Form algorithm for multiplication of 4- and 5-digit factors by a 1-digit factor

## PACING

Level A All

Level B All

Level C All

## VOCABULARY

crivets (nonsense word)

## RELATED AIDS

BFA PROB. SOLVING LAB II — 73.

## SUGGESTIONS

**Initial Activity** Using chalkboard examples, demonstrate carefully the steps in the algorithm. Include 4- and 5-digit multiplicands. In order to promote understanding, you may want to match each example with the appropriate Column Form algorithm.

Short Form	Column Form
$\begin{array}{r} 4786 \\ \times 6 \\ \hline 28716 \end{array}$	$\begin{array}{r} 4786 \\ \times 6 \\ \hline 36 \\ 480 \\ 4200 \\ 24000 \\ \hline 28716 \end{array}$

## USING THE BOOK

As you read through the pupil display, assure the pupils that, though the numbers are getting larger on this page, the multiplication process remains the same.

You may want to reserve Exercises 17 to 20 for more able students, or you could use these exercises as a challenge for anyone who wishes to try them. Encourage students to find the products for Exercises 17 and 18 and then predict the products for Exercises 19 and 20. Predictions should be checked by multiplying.

Encourage students to discuss the pattern(s) they observed and how they used the pattern(s) to predict the remaining products. You may want to make a list of all the patterns discovered.

## ACTIVITIES

1. Students could create their own "nonsense products" and write mini-stories based on them.

**Example**

4 cases of dorfy duffles.  
3205 dorfy duffles in each case.  
How many dorfy duffles altogether? [12 820]

2. Some students might wish to complete the series of patterns suggested by Exercises 17 to 20. Results could be shared with the rest of the class.

$\begin{array}{r} 999999 \\ \times 2 \\ \hline [1999998] \end{array}$	$\begin{array}{r} 999999 \\ \times 3 \\ \hline [2999997] \end{array}$	$\begin{array}{r} 999999 \\ \times 4 \\ \hline [3999996] \end{array}$
---	---	---

$\begin{array}{r} 999999 \\ \times 9 \\ \hline [8999991] \end{array}$
---

3. Place these two series on the chalkboard as a challenge to students.

Suggest that the first four or five questions be calculated and then encourage students to predict the remaining products. As usual, predictions should be checked, either using the multiplication algorithm or a mini-calculator.

$$\begin{aligned} 1089 \times 1 &= \blacksquare [1089] \\ 1089 \times 2 &= \blacksquare [2178] \\ 1089 \times 3 &= \blacksquare [3267] \\ 1089 \times 4 &= \blacksquare [4356] \end{aligned}$$

•  
•  
•

$$1089 \times 9 = \blacksquare [9801]$$

$$\begin{aligned} 10989 \times 9 &= \blacksquare [98901] \\ 10989 \times 8 &= \blacksquare [87912] \\ 10989 \times 7 &= \blacksquare [76923] \\ 10989 \times 6 &= \blacksquare [65934] \end{aligned}$$

•  
•  
•

$$10989 \times 1 = \blacksquare [10989]$$



## OBJECTIVE

To estimate products of 2- and 3-digit factors multiplied by 1-digit factors

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

HMS—DM18.

## BACKGROUND

Some students view estimation as “just extra work”. Others may be tempted to estimate after the paper-and-pencil calculations have been completed, incorrectly assuming that estimation provides an exact check for the written answer. In both cases, you might encourage these students to think of estimation as a brief mental exercise that provides a fairly effective guide to the reasonableness of a calculated answer.

Students may wonder what constitutes a *reasonable* answer. Point out that this is largely a matter of interpretation based on sound “number sense”. This intuitive feeling can also be aided by arithmetic. For example, the example in the display at the top of the pupil page shows the estimate to be  $6 \times 40 = 240$ . The calculated answer is  $6 \times 42 = 252$ , which is reasonable.

If a student has calculated that  $6 \times 42 = 262$ , the product, while *incorrect*, is still considered to be reasonable. If a student has calculated that  $6 \times 42 = 312$ , the product is both *incorrect and unreasonable*.

Estimation is not only important as a pre-calculation device for paper-and-pencil arithmetic, but it is also increasingly vital as the use of mini-calculators in classrooms becomes more widespread.

## SUGGESTIONS

**Initial Activity** Depending on the current status of your class, you may want to review briefly: (a) rounding numbers to the nearest 10, 100, and 1000; (b) multiplication of multiples of 10, 100, and 1000 by a single-digit factor.

## USING THE BOOK

You may want to use Exercises 1 to 6 orally. If a calculator is available, have a student calculate the exact answer for each exercise and then compare that result with the estimate.

## Estimation

Jamie bought 6 sheets of stamps from interesting countries. Each sheet has 42 stamps. How many stamps did Jamie buy altogether?

Estimate:  
 $6 \times 42$

then

Calculate:

Jamie writes:  $42$   
 $\times 6$   

---

 $252$

Jamie rounds the greater.

He thinks:  $6 \times 40 = 240$

About 240 stamps.

252 stamps.

Jamie bought 252 stamps.

Is Jamie's written answer reasonable?



An estimate helps tell whether a calculated answer is reasonable.

### Exercises

Copy and complete these estimates.

To estimate	Think:
1. $3 \times 56$	$3 \times 60 = 180$
2. $7 \times 236$	$7 \times 200 = 1400$
3. $4 \times 71$	$4 \times 70 = 280$
4. $6 \times 387$	$6 \times 400 = 2400$
5. $8 \times 4163$	$8 \times 4000 = 32000$
6. $7 \times 5921$	$7 \times 6000 = 42000$

Estimate, then calculate. Are your calculated answers reasonable?

7. $47 \times 8$ About 400. $376$	8. $34 \times 6$ About 180. $204$	9. $65 \times 4$ About 280. $260$	10. $73 \times 9$ About 630. $657$	11. $28 \times 2$ About 60. $56$
12. $864 \times 3$ About 2700. $2592$	13. $510 \times 5$ About 2500. $2550$	14. $195 \times 9$ About 1800. $1755$	15. $481 \times 7$ About 3500. $3367$	16. $629 \times 6$ About 3600. $3774$

76 Estimation of products

As students work on Exercises 7 to 16, they could estimate the products mentally, record only the estimates, and then calculate the actual products.

If some students require extra practice, assign a selection of exercises from pages 73 to 75, or see the Extra Practice section for this chapter on pages 330 and 331 of the student's book.

## ACTIVITIES

- Students might enjoy playing “Estimation” (two to four players).
  - Remove the tens, jacks, queens, and kings from a deck of ordinary playing cards. (Aces count as one.)
  - Players decide beforehand which single-digit multiplier will be used for the game (e.g., 6).
  - Shuffle the cards and place them face down.
  - The first player draws two cards from the top of the deck and makes the greatest possible 2-digit number. For example, if a player draws a 3 and a 7, the greatest 2-digit number is 73.

- The player rounds off the number and multiplies by the multiplier chosen before the start of the game. The resulting product is that player's score for the first round.

73 rounds to 70  
 $6 \times 70 = 420$

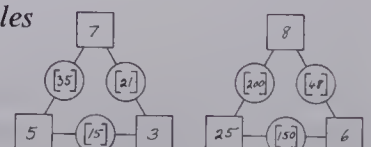
The player's score is 420.

- Play continues for all other players to complete the round. The player with the greatest total score after five rounds is the winner.

**Variations:** Choose a different multiplier, e.g., 3, 7, 2, or 5. Players might draw 3 cards in order to make the greatest 3-digit number. Or, the player with the *least* score could be the winner. (In this case, players would attempt to create the smallest possible 2- or 3-digit numbers with the cards.)

2. Multiply the numbers in the boxes. Record the products in the circles. Make your own and exchange with a classmate.

Examples



# Thinking About Addition

Linda thinks about addition to help with multiplication!



	Addition	Multiplication
$\begin{array}{r} 0.5 \\ \times 3 \\ \hline ? \end{array}$	$\begin{array}{r} 0.5 \\ 0.5 \\ + 0.5 \\ \hline 1.5 \end{array}$	$\begin{array}{r} 0.5 \\ \times 3 \\ \hline 1.5 \end{array}$
$\begin{array}{r} 1.7 \\ \times 2 \\ \hline ? \end{array}$	$\begin{array}{r} 1.7 \\ + 1.7 \\ \hline 3.4 \end{array}$	$\begin{array}{r} 1.7 \\ \times 2 \\ \hline 3.4 \end{array}$

## Exercises

Copy and complete.

- $$\begin{array}{r} 0.6 \\ \times 2 \\ \hline ? \end{array}$$

$$\begin{array}{r} 0.6 \\ + 0.6 \\ \hline 1.2 \end{array}$$

$$\begin{array}{r} 0.6 \\ \times 2 \\ \hline 1.2 \end{array}$$
- $$\begin{array}{r} 0.9 \\ \times 3 \\ \hline ? \end{array}$$

$$\begin{array}{r} 0.9 \\ + 0.9 \\ + 0.9 \\ \hline 2.7 \end{array}$$

$$\begin{array}{r} 0.9 \\ \times 3 \\ \hline 2.7 \end{array}$$
- $$\begin{array}{r} 1.4 \\ \times 3 \\ \hline ? \end{array}$$

$$\begin{array}{r} 1.4 \\ + 1.4 \\ + 1.4 \\ \hline 4.2 \end{array}$$

$$\begin{array}{r} 1.4 \\ \times 3 \\ \hline 4.2 \end{array}$$
- $$\begin{array}{r} 2.6 \\ \times 2 \\ \hline ? \end{array}$$

$$\begin{array}{r} 2.6 \\ + 2.6 \\ \hline 5.2 \end{array}$$

$$\begin{array}{r} 2.6 \\ \times 2 \\ \hline 5.2 \end{array}$$

Multiply. Think about addition to help.

- $$\begin{array}{r} 0.7 \\ \times 2 \\ \hline 1.4 \end{array}$$
- $$\begin{array}{r} 0.4 \\ \times 3 \\ \hline 1.2 \end{array}$$
- $$\begin{array}{r} 0.3 \\ \times 5 \\ \hline 1.5 \end{array}$$
- $$\begin{array}{r} 0.6 \\ \times 3 \\ \hline 1.8 \end{array}$$
- $$\begin{array}{r} 0.7 \\ \times 3 \\ \hline 2.1 \end{array}$$
- $$\begin{array}{r} 1.6 \\ \times 2 \\ \hline 3.2 \end{array}$$
- $$\begin{array}{r} 1.9 \\ \times 3 \\ \hline 5.7 \end{array}$$
- $$\begin{array}{r} 2.5 \\ \times 3 \\ \hline 7.5 \end{array}$$
- $$\begin{array}{r} 6.3 \\ \times 4 \\ \hline 25.2 \end{array}$$
- $$\begin{array}{r} 2.5 \\ \times 4 \\ \hline 10.0 \end{array}$$

Multiplication of 2-digit decimals (tenths) by a 1-digit whole number 77

## OBJECTIVE

To multiply a 2-digit decimal (tenths) by a 1-digit whole number

## PACING

Level A All  
Level B All  
Level C All

## BACKGROUND

The fact that the number of decimal places in the product is equal to the sum of the number of decimal places in the factor(s) can be demonstrated in terms of fractions.

Examples

$$\begin{aligned} (a) \quad 4 \times 23.9 &= (4 \times 23) + \left(4 \times \frac{9}{10}\right) \\ &= 92 + \frac{36}{10} \\ &= 92 + \frac{6}{10} \\ &= 92.6 \end{aligned}$$

$$\begin{aligned} (b) \quad 3 \times 2.51 &= (3 \times 2) + \left(3 \times \frac{51}{100}\right) \\ &= 6 + \frac{153}{100} \\ &= 6 + \frac{53}{100} \\ &= 6.53 \end{aligned}$$

Addition can also be used to demonstrate the proper placement of the decimal in the product.

Example

$$4 \times 23.9$$

$$\begin{array}{r} 23.9 \\ 23.9 \\ 23.9 \\ + 23.9 \\ \hline 95.6 \end{array}$$

Finally, rounding and estimation, combined with a sound number sense can be used.

Example

$4 \times 23.9$        $4 \times 20 = 80$   
Because the factor was rounded down, the actual product will be slightly more than 80.

$$\begin{array}{r} 23.9 \\ \times 4 \\ \hline 95.6 \end{array}$$

Where should the decimal be put?

0.956? 9.56? 95.6? 956.?

95.6 is slightly more than 80, therefore the decimal is placed between the "5" and the "6".

$$\begin{array}{r} 23.9 \\ \times 4 \\ \hline 95.6 \end{array}$$

## SUGGESTIONS

**Initial Activity** Use the display in the student's book (or a similar example) to develop the two main ideas for this lesson.

- The format for multiplication of decimals is basically the same as for multiplication of whole numbers.
- A relationship exists between the number of decimal places in the factor(s) and the number of decimal places in the product.

Some students may already know the rule about placement of the decimal point (see Background). Others may be under the impression that the decimal point in the product is simply lined up under the decimal point in the factor.

$$\begin{array}{r} 0.5 \\ \times 3 \\ \hline 1.5 \end{array}$$

You might want to clarify this assumption immediately or permit the issue to resolve itself in later lessons.

## USING THE BOOK

Exercises 1 to 4 could be used as a demonstration for the whole class by

having some students complete the parts on the chalkboard.

Exercises 5 to 14 could be used for independent work. Once the exercises are completed, ask students to read the products orally to reinforce the skill of reading numbers and to highlight place value.

## ACTIVITIES

- Provide, or have students create, exercises similar to these.

Examples

Write a matching multiplication question for each addition example, then solve.

$$\begin{array}{r} (a) \quad 4.3 \\ 4.3 \\ 4.3 \\ 4.3 \\ + 4.3 \\ \hline \end{array} \quad \begin{array}{r} 4.3 \\ \times 5 \\ \hline 21.5 \end{array}$$

$$\begin{array}{r} (b) \quad 0.9 \\ 0.9 \\ + 0.9 \\ \hline \end{array} \quad \begin{array}{r} 0.9 \\ \times 3 \\ \hline 2.7 \end{array}$$

- See Quad-Row as described in the Activity Reservoir, specifically the first variation.



## OBJECTIVE

To multiply a 3-digit decimal (tenths) by a 1-digit whole number

## PACING

Level A All  
Level B All  
Level C All

## SUGGESTIONS

**Initial Activity** You may want to review multiplication of whole numbers and stress the steps in the algorithm. Encourage students as you work through the examples to handle the regrouped numbers ("helper numbers") mentally. Then, capitalize on the concepts developed in the previous lesson by demonstrating multiplication of decimals on the chalkboard. The following approach might be used:

### Example

Multiplication is repeated addition. This fact demonstrates the proper placement of the decimal point and helps us to devise a simple rule (i.e., the total number of decimal places in the factor(s) is equal to the number of decimal places in the product).

$$\begin{array}{r} 23.9 \\ \times 4 \\ \hline ? \end{array}$$

$$\begin{array}{r} 23.9 \\ \times 4 \\ \hline 95.6 \end{array}$$

23.9 (1 decimal place)  
23.9 (1 decimal place)  
95.6 (1 decimal place)

Demonstrate, too, the value of using estimation. An estimated product suggests whether the calculated product is reasonable and it also reinforces the correct placement of the decimal point.

### Example

$$\begin{array}{r} 23.9 \\ \times 4 \\ \hline ? \end{array}$$

$$\begin{array}{r} 20 \\ \times 4 \\ \hline 80 \end{array}$$

$$\begin{array}{r} 23.9 \\ \times 4 \\ \hline 95.6 \end{array}$$

Because the multiplicand was rounded down, the actual product will be slightly more than 80. Therefore, 95.6 is a reasonable answer.

## USING THE BOOK

As they work through the exercises, identify those students who are having difficulty. If mechanical errors are being made, review the steps in the multiplication algorithm with these students. Drill with basic multiplication facts may be beneficial as well.

## ACTIVITIES

1. Provide multiplication-addition drill for those students who are having difficulty with mechanical errors.

## Road Racing

Ron and Mary Ann like to build tracks for their road racing set.

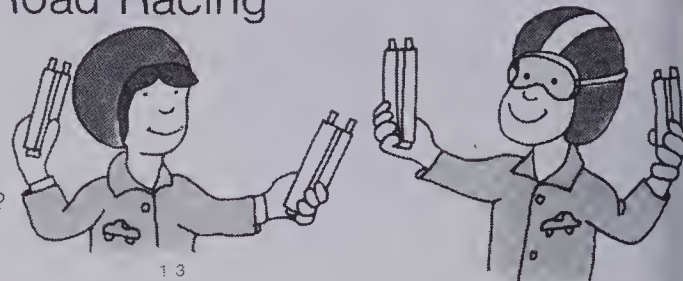
Ron put together 4 pieces of track.

Each piece is 23.9 cm long.

How long is the total section of track?

Multiply as you would with whole numbers.

Estimate:  
 $4 \times 20 = 80$



$$\begin{array}{r} 23.9 \\ \times 4 \\ \hline 95.6 \end{array}$$

One decimal place in this factor.  
No decimal places in this factor.  
One decimal place in the product.

The section is 95.6 cm long.

### Exercises

Write your estimate. Calculate the exact answer.

1.  $37.2 \times 6$  About 240.

2.  $223.2 \times 2$  About 180.

3.  $172.8 \times 3$  About 300.

4.  $292.2 \times 2$  About 120.

5.  $121.6 \times 2$  About 120.

6.  $40.7 \times 3$  About 120.

7.  $122.1 \times 7$  About 210.

8.  $200.2 \times 4$  About 80.

9.  $72.8 \times 7$  About 140.

10.  $172.2 \times 7$  About 140.

11.  $52.1 \times 8$  About 400.

12.  $416.8 \times 9$  About 360.

13.  $360.9 \times 8$  About 320.

14.  $281.6 \times 5$  About 200.

15.  $177.5 \times 5$  About 200.

16.  $65.0 \times 4$  About 280.

17.  $260.0 \times 5$  About 350.

18.  $361.5 \times 6$  About 480.

19.  $502.2 \times 4$  About 320.

20.  $305.2 \times 4$  About 320.

Solve these mini-problems.

17. 6 pieces of track.

Each piece is 39.9 cm long.

How long is total section? 239.4 cm

18. 5 pieces of track.

Each piece is 50.2 cm long.

How long is total section? 251.0 cm

78 Multiplication of a 3-digit decimal (tenths) by a 1-digit whole number

- (a)  $6 \times 4 + 3$  (b)  $3 \times 2 + 1$  (c)  $4 \times 5 + 2$   
(d)  $7 \times 5 + 2$  (e)  $6 \times 7 + 5$  (f)  $5 \times 8 + 2$

2. Review comparison of numbers, then provide questions similar to these. Use  $<$  or  $>$ .

- (a)  $4 \times 13.6 \bullet 5 \times 14.1$   
(b)  $2 \times 25.6 \bullet 6 \times 9.7$

3. Copy this number puzzle on the chalkboard or on a ditto. More able students might enjoy creating their own puzzles. (Answers are given.)

a	b	c
[1]	[8]	[4]
	[1]	[9]
d	e	
[5]	[4]	[2]
f	[3]	[8]

### ACROSS

- a  $7 \times 263$   
e  $7 \times 6$   
f  $6 \times 73$

### DOWN

- b  $9 \times 9$   
c  $8 \times 24$   
d  $9 \times 6$   
e  $6 \times 8$



3 1 2  
47.35 ← How many decimal places in the factors?  
x 5  
-----  
236.75 ← How many decimal places in the product?

The total cost is \$236.75.

Estimate:  
 $5 \times 50 = 250.$

Multiply.

$\begin{array}{r} \$2.45 \\ \times \quad 4 \\ \hline \$9.80 \\ \$62.34 \\ \hline \end{array}$	$\begin{array}{r} 2. \quad \$4.90 \\ \times \quad 3 \\ \hline \$14.70 \\ \hline \end{array}$	$\begin{array}{r} 3. \quad \$6.05 \\ \times \quad 5 \\ \hline \$30.25 \\ \hline \end{array}$	$\begin{array}{r} 4. \quad \$3.29 \\ \times \quad 7 \\ \hline \$23.03 \\ \hline \end{array}$
$\begin{array}{r} \$62.34 \\ \times \quad 4 \\ \hline \$249.36 \\ \$104.29 \\ \hline \end{array}$	$\begin{array}{r} 6. \quad \$25.98 \\ \times \quad 3 \\ \hline \$77.94 \\ \hline \end{array}$	$\begin{array}{r} 7. \quad \$40.15 \\ \times \quad 6 \\ \hline \$240.90 \\ \hline \end{array}$	$\begin{array}{r} 8. \quad \$83.60 \\ \times \quad 5 \\ \hline \$418.00 \\ \hline \end{array}$
$\begin{array}{r} 13. \quad 506.10 \\ \times \quad 5 \\ \hline \$521.45 \\ \hline \end{array}$	$\begin{array}{r} 10. \quad \$420.73 \\ \times \quad 2 \\ \hline \$841.46 \\ \hline \end{array}$	$\begin{array}{r} 11. \quad \$153.68 \\ \times \quad 3 \\ \hline \$461.04 \\ \hline \end{array}$	$\begin{array}{r} 12. \quad \$398.05 \\ \times \quad 7 \\ \hline \$2786.35 \\ \hline \end{array}$
$\begin{array}{r} 13. \quad 506.10 \\ \times \quad 8 \\ \hline 4048.80 \\ \hline \end{array}$	$\begin{array}{r} 14. \quad 726.40 \\ \times \quad 6 \\ \hline 4358.40 \\ \hline \end{array}$	$\begin{array}{r} 15. \quad 499.09 \\ \times \quad 4 \\ \hline 1996.36 \\ \hline \end{array}$	$\begin{array}{r} 16. \quad 815.25 \\ \times \quad 7 \\ \hline 5706.75 \\ \hline \end{array}$

17. 2 wall hangings. \$99.67 each.	18. 3 planters. \$80.49 each.	19. 5 paintings. \$136.25 each.	★ 23. Find the total cost of the furniture. \$8488.89
<b>\$199.34</b>	<b>\$241.47</b>	<b>\$681.25</b>	
20. 3 large rugs. \$359.08 each.	21. 9 coffee tables. \$274.85 each.	22. 6 sofas. \$635.99 each.	
<b>\$1077.24</b>	<b>\$2473.65</b>	<b>\$3815.94</b>	

Multiplication of a 4- and 5-digit decimal (hundredths) by a 1-digit whole number 79

(a) Draw boxes or blanks appropriate to the multiplication question desired. For example, for 1-digit times a 3-digit use:

$$\begin{array}{r} \text{---} \\ \times \text{---} \\ \hline \end{array} \quad \text{or} \quad \begin{array}{r} \square \square \square \\ \times \square \\ \hline \end{array}$$

- Sample play.* Digits spun: 3, 8, 1, and 4.

$$\begin{array}{r} \text{Player 1} \\ \begin{array}{r} \underline{8 \ 3 \ 1} \\ \times \quad \underline{4} \\ \hline 3 \ 3 \ 2 \ 4 \end{array} \end{array}$$

Player 1 is the winner.  
Before starting the second round, encourage students to create the greatest *possible* product given the four digits spun.

\$4.25	\$4.25	\$4.25
$\times 3$	4.25	$\times 3$
<hr/>	+ 4.25	<hr/>
	\$12.75	\$12.75

154.62  
 “one hundred fifty-four decimal six two”  
 or  
 “one hundred fifty-four and sixty-two  
 hundredths”

$$\begin{array}{r} 431 \\ \times 8 \\ \hline 3448 \end{array}$$

Extend the game to include decimals.  
Start with simple examples with 2- and  
3-digit numbers (tenths).

\_\_\_\_\_ • \_\_\_\_\_

× \_\_\_\_\_

\_\_\_\_\_ • \_\_\_\_\_

× \_\_\_\_\_

## OBJECTIVE

To solve word problems by writing number sentences

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

skateboards, propane Bar-B-Q's, outboard motors, archery sets, tent patch kits, pool cleaner tablets

## SUGGESTIONS

**Initial Activity** Review the use of a placeholder (variable). Demonstrate this on the chalkboard using basic facts.

**Examples**

(a)  $4 \times 5 = N$

$4 \times 5 = 20$

(b)  $6 \times 7 = N$

$6 \times 7 = 42$

(c)  $8 \times 4 = N$

$8 \times 4 = 32$

Discuss the function of the placeholder with students. That is, that it simply reserves the place of an unknown quantity until its value can be calculated.

If necessary, review the meanings of the four symbols used to represent Professor Q's questions. Remind students that the four questions are to be answered mentally. This is particularly appropriate for these exercises because they are written in "mini-story" form with the basic data clearly identified.

## USING THE BOOK

You might find it beneficial to work together with the students on Exercises 1 and 2. Exercises 3 to 10 could be assigned for independent work.

Note that Exercises 9 and 10 have extra (unnecessary) information. You may want to make students aware of this. Alternatively, you may want to watch carefully to see how students handle this unnecessary information on their own.

Read through the word problems together to ensure that the pupils can read all of the words (see Vocabulary).

## Spring Inventory

Mr. Franklin is checking his stock for spring.

6 "Super Form" skateboards.

Each costs \$23.98.

What is the total value of the skateboards?

Step 1. Find answers to Professor Q's four questions.



Skateboards.



What is total value?



6 skateboards.  
\$23.98 each.



Multiply.

Step 2. Write a number sentence to fit the problem.

$6 \times 23.98 = N$

Step 3. Make the sentence true.  $6 \times 23.98 = 143.88$

Step 4. The total value of the skateboards is \$143.88.



### Exercises

1. 7 sleeping bags.

\$36.95 each.

What is the total value?

(a) Answer Professor Q's four questions.

(b) Choose the number sentence that fits the problem. (iii)

(i)  $36.95 \div 7 = N$

(ii)  $N \times 7 = 36.95$

(iii)  $7 \times 36.95 = N$

(c) Make the sentence true.

$7 \times 36.95 = 258.65$

(d) Write a statement.

The total value is \$258.65.

2. 8 large crates.

32 boxes of grass seed in each crate.

How many boxes of grass seed altogether?

(a) Answer Professor Q's four questions.

(b) Choose the number sentence that fits the problem. (ii)

(i)  $8 \times N = 32$

(ii)  $8 \times 32 = N$

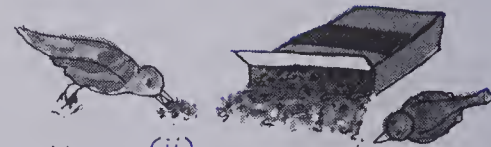
(iii)  $32 \div N = 8$

(c) Make the sentence true.

$8 \times 32 = 256$

(d) Write a statement.

There are 256 boxes of grass seed altogether.





For each of the following:

- Answer Professor Q's four questions *mentally*.
- Write a number sentence to fit the problem.
- Make the sentence true.
- Write a statement.

● 3 propane Bar-B-Q's.  
\$179.85 each.  
What is the total value? **\$539.55**

4. 24 cases of house paint.  
9 cans in each case.  
How many cans of house paint altogether? **216**

5. 4 outboard motors.  
\$465.79 each.  
What is the total value? **\$1863.16**

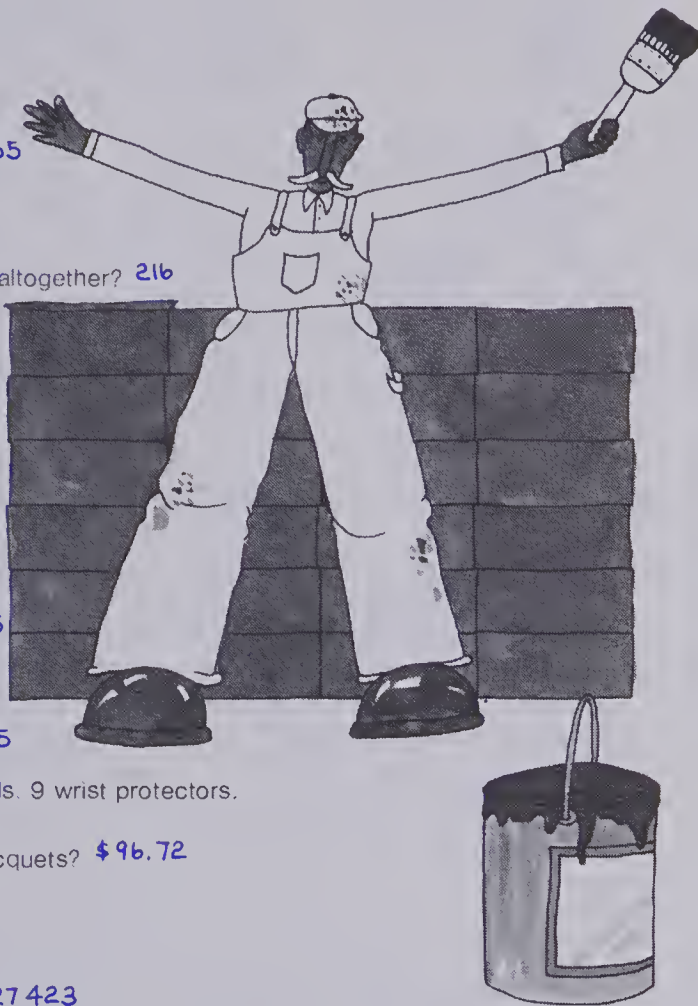
6. 6 five-speed bikes.  
\$110.00 each.  
What is the total value? **\$660.00**

7. 5 archery sets.  
\$68.45 each.  
What is the total value? **\$342.25**

8. 5 cartons of tent patch kits.  
255 kits in each carton.  
How many kits altogether? **1275**

★ 9. 8 tennis racquets. 14 tennis balls. 9 wrist protectors.  
\$12.09 for each racquet.  
What is the total value of the racquets? **\$96.72**

★ 10. 9 cases of pool cleaner tablets.  
\$84.79 for each case.  
3047 tablets in each case.  
How many tablets altogether? **27423**



$4 \times 8$	$2 \times 2$	$3 \times 8$
$2 \times 6$	$5 \times 4$	$7 \times 4$
$4 \times 4$	$6 \times 6$	$8 \times 1$

[32]	[4]	[24]
[12]	[20]	[28]
[16]	[36]	[8]

[Magic sum: 60]  
(c) Try this one. Does it result in a magic square? If so, what is the magic sum?

$69 - 18$	$25 - 16$	$12 + 27$
$3 \times 7$	$51 - 18$	$9 \times 5$
$13 + 14$	$22 + 35$	$24 - 9$

[51]	[9]	[39]
[21]	[33]	[45]
[27]	[57]	[15]

[Magic sum: 99]

3. See "Quad-Row" as described in the Activity Reservoir.

Problems 81

## ACTIVITIES

1. Some students might enjoy creating their own multiplication mini-stories. Provide some structure through the use of catalogues and a simple chart. The final mini-stories could be used immediately for extra practice or placed in your problem-solving file for use at a later date.

Chart

	Item	No. of Items	Unit Cost
	Lawn mower	3	\$199.00
Mini-Story	The City Parks Committee bought 3 lawnmowers. Each was on sale for \$199.00. What is the total value?		

2. Some students might benefit from further review and practise with various operations. Magic squares can be a source of interesting drill and they are self-checking.

(a)

8	1	6	[15]
3	5	7	[15]
4	9	2	[15]
[15]	[15]	[15]	[15]

Add vertically, horizontally, and diagonally. What is the magic sum? [All sums are the same; the magic sum is 15.]

(b) Multiply, then write the products in the matching cells of the other grid. Add the products vertically, horizontally, and diagonally. Is it a magic square? What is the magic sum?



## OBJECTIVE

To multiply a decimal (thousandths) by a 1-digit factor

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

machinist, bearing(s)

## RELATED AIDS

HMS — DM19.

## SUGGESTIONS

**Initial Activity** It would be appropriate here to review and consolidate skills associated with multiplication. You may want to include some or all of these suggestions.

(a) Provide students with the opportunity to read aloud numbers in the thousandths.

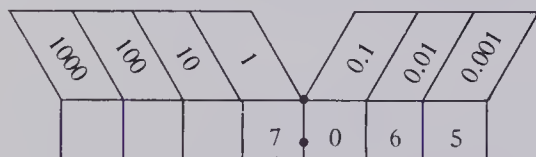
7.065

“seven decimal zero six five”  
or

“seven and sixty-five thousandths”  
You may want to supplement this with a review and extension of expanded notation.

$7.065 = (7 \times 1) + (0 \times 0.1) + (6 \times 0.01) + (5 \times 0.001)$

Construction of a place-value chart would reinforce the expanded form and oral reading.



- (b) Students might benefit from a review of the steps of the multiplication algorithm. As you demonstrate the use of regrouped numbers (“helper numbers”), encourage students to handle this mentally. (This becomes particularly important when students deal with 2- and 3-digit multiples.) Stress, too, the rule for proper placement of the decimal point.

- (c) Rounding and estimation skills could be reviewed and consolidated. Remind students that estimation helps us to gauge the reasonableness of a calculated product, and when decimals are involved, it helps in the placement of the decimal.

$$3 \times 5.217 \rightarrow 3 \times 5 = 15 \rightarrow 5.217$$

$$\begin{array}{r} 5.217 \\ \times 3 \\ \hline 15.651 \end{array}$$

## Engine Parts

A machinist is making parts for some airplane engines.



Five bearings are machined to fit next to each other. Each bearing is 1.235 cm wide. What is the total width of the five bearings?

$$\begin{array}{r} 1.235 \\ \times 5 \\ \hline 6.175 \end{array}$$

The total width is 6.175 cm.

### Exercises

Multiply to find the size of these engine parts.

1.  $1.413 \times 6$  **8.478**      2.  $2.015 \times 3$  **6.045**      3.  $2.827 \times 5$  **14.135**  
4.  $1.206 \times 9$  **10.854**      5.  $3.158 \times 4$  **12.632**      6.  $2.066 \times 7$  **14.462**

Multiply.

7.  $5.417 \times 3$  **16.251**      8.  $6.059 \times 4$  **24.236**      9.  $4.117 \times 6$  **24.702**      10.  $3.909 \times 5$  **19.545**  
11.  $7.251 \times 8$  **58.008**      12.  $4.905 \times 6$  **29.430**      13.  $8.236 \times 2$  **16.472**      14.  $5.801 \times 7$  **40.607**  
15.  $9.151 \times 8$  **73.208**      16.  $3.999 \times 2$  **7.998**      17.  $6.006 \times 4$  **24.024**      18.  $7.532 \times 9$  **67.788**

Solve.

19. 7 bearings.  
Each one is 1.088 cm thick.  
How thick altogether? **7.616 cm**
20. 9 steel plates.  
Each one is 2.101 cm thick.  
How thick altogether? **18.909 cm**

82 Multiplication of a decimal (thousandths) by a 1-digit whole number

## USING THE BOOK

Encourage students to record the estimated product first and then multiply to find the actual product. For example, in Exercise 2:

Estimate:  $6. \quad 2.015$

$$\begin{array}{r} 2.015 \\ \times 3 \\ \hline 6.045 \end{array}$$

## ACTIVITIES

1. Write these challenges on the chalkboard.

- (a) Place the digits 4, 6, 1, 2, and 8 in the diagram to make the greatest possible product.

$$\begin{array}{r} 6421 \\ \times 8 \\ \hline [51368] \end{array}$$

- (b) Place the digits 7, 1, 5, 3, and 9 in the diagram to make the greatest possible product.

$$\begin{array}{r} 7531 \\ \times 9 \\ \hline [67779] \end{array}$$

- (c) Place the digits 0, 4, 8, 2, and 7 in the diagram to make the *least* possible product. (The product must be greater than zero.)

$$\begin{array}{r} 0.478 \\ \times 2 \\ \hline [0.956] \end{array}$$

2. Explore patterns and the placement of the decimal point.

**Example**

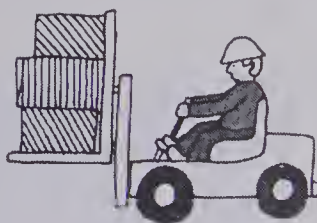
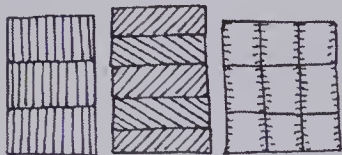
Multiply to find the first product. Write the other products *without* multiplying. Watch out for the decimal point!

(a)  $2416 \times 7$  **[16912]**      (b)  $241.6 \times 7$  **[1691.2]**

(c)  $24.16 \times 7$  **[169.12]**      (d)  $2.416 \times 7$  **[16.912]**

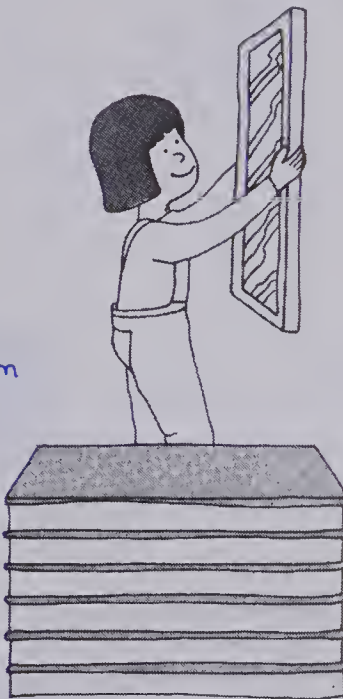
## Warehouse Stacks

Supplies are neatly stacked in a warehouse until they are needed.



### Exercises

1. Some house bricks are 5.315 cm thick.  
Rob stacked these bricks in a pile 8 bricks high.  
How high was the pile of bricks? **42.52 cm**
2. Some ceiling tile is 2.019 cm thick.  
Bill stacked the tiles in piles of 6.  
How high was each pile? **12.114 cm**
3. Susan is storing some "How to Build a House" books.  
Each book is 5.107 cm thick.  
She put 9 books in each pile.  
How high is each stack of building books? **45.963 cm**
4. Bruce is stacking 4 boxes of nails in each pile.  
Each box has a mass of 5.145 kg.  
What is the total mass of each pile? **20.58 kg**
5. Five wood planks are piled neatly in a stack.  
Each plank is 3.924 cm thick.  
How high is the stack? **19.62 cm**
- ★ 6. In one corner there are 8 cement blocks in a stack.  
Each block is 21.395 cm thick.  
How high is the stack? **171.16 cm**
- ★ 7. Freda is helping to stack some livingroom mirrors which are 4.625 mm thick.  
Between each mirror she places cardboard which is 1.703 mm thick.  
How high is a pile of 7 mirrors including the cardboard? **42.593 mm**



Word problems — multiplication 83

## OBJECTIVE

To solve word problems involving multiplication of a decimal by a 1-digit whole number

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

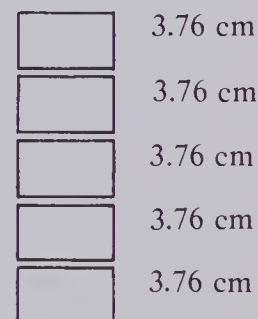
supplies, warehouse, ceiling tile, planks

## SUGGESTIONS

**Initial Activity** If necessary, review Professor Q's four questions and the format that you have established for problem solving. The exercises on this page lend themselves to the drawing of simple diagrams. Students might benefit from a demonstration such as this.

### Example

5 books in a stack. Each is 3.76 cm thick. How high is the stack?



5 groups of 3.76 or  $5 \times 3.76$

$$5 \times 3.76 = 18.80$$

The stack is 18.8 cm high.

Students should not be required to draw diagrams if they understand the essence of the problem. Rather, they should be encouraged to use a diagram to help clarify a problem with which they are having difficulty.

## USING THE BOOK

Note that Exercise 6 requires the use of a 5-digit multiplicand.

Exercise 7 is a 3-step problem. You may want to reserve this exercise for the more able students. Also, answers may vary depending on certain assumptions students might make. For example, does "between each mirror" mean that a piece of cardboard is also placed between the floor and the first mirror?

## ACTIVITIES

1. Students might enjoy creating some of their own "warehouse stacks" problems. Provide them with a framework for each one.

(a) Sean is stacking 5 \_\_\_\_\_ in a pile.  
Each \_\_\_\_\_ is 6.713 cm thick.  
How high is the pile?

(b) Marion stacked \_\_\_\_\_ tiles in piles of 8.

Each tile is \_\_\_\_\_ cm thick.

How thick is each pile?

(c) \_\_\_\_\_ boxes of \_\_\_\_\_ are piled in a stack.

Each box has a mass of \_\_\_\_\_.

What is the total mass of the pile?

2. If you have not already done so, see the Activities listed for pages 79 to 82 for ideas which can be used here.



## OBJECTIVE

To multiply factors which are multiples of 10 and 100

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

kilojoules (kJ), spoonful, creamer

## BACKGROUND

The relationship of the number of zeros in the factors to the number of zeros in the product can be demonstrated this way.

$$\begin{aligned} 300 \times 800 &= (3 \times 100) \times (8 \times 100) \\ &= (3 \times 8) \times (100 \times 100) \\ &= 24 \times 10\,000 \\ &= 240\,000 \end{aligned}$$

## SUGGESTIONS

**Initial Activity** Have students develop a rule to help them determine the number of zeros in the product based on the total number of zeros in the factors. For example,

$$\begin{array}{ccc} 50 & \times & 300 \\ \downarrow & & \downarrow \\ 1 \text{ zero} & & 2 \text{ zeros} \end{array} = 15\,000 \quad \begin{array}{c} \downarrow \\ 3 \text{ zeros} \end{array}$$

Before assigning the exercises, make sure that students are aware of examples where the initial "basic fact" ends in a zero. For example,

$$\begin{array}{ccc} 50 & \times & 600 \\ \downarrow & & \downarrow \\ 1 & & 2 \end{array} = 30\,000 \quad \begin{array}{c} \downarrow \\ 3 \end{array}$$

Students should distinguish the zero in "30" from the others in their rule.

## USING THE BOOK

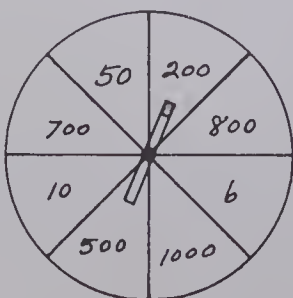
You may want students to write complete number sentences for Exercises 1 and 2.

1. (a)  $5 \times 200 = 1000$

Exercises 3 and 4 could be done mentally with just the product being recorded.

## ACTIVITIES

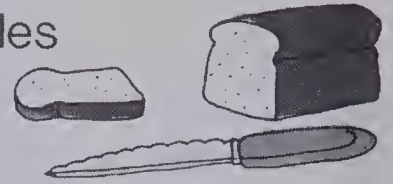
1. Construct pairs of spinners as illustrated using cardboard circles and stir sticks held in place with thumb tacks.



## Counting Kilojoules

There are about 300 kJ in one slice of white bread.

Physical activity burns up kilojoules (kJ).



How many kilojoules in

(a) 5 slices?

(b) 10 slices?

(c) 50 slices?

(d) 200 slices?

(e) 800 slices?

$$\begin{array}{r} (a) \quad 300 \\ \times \quad 5 \\ \hline 1500 \end{array}$$

$$\begin{array}{r} (b) \quad 300 \quad \text{3 zeros} \\ \times \quad 10 \\ \hline 3000 \quad \text{3 zeros} \end{array}$$

$$\begin{array}{r} (c) \quad 300 \\ \times \quad 50 \\ \hline 15\,000 \end{array}$$

$$\begin{array}{r} (d) \quad 300 \quad \text{4 zeros} \\ \times \quad 200 \\ \hline 60\,000 \quad \text{4 zeros} \end{array}$$

$$\begin{array}{r} (e) \quad 300 \\ \times \quad 800 \\ \hline 240\,000 \end{array}$$

### Exercises

1. A medium-sized orange has about 200 kJ.

How many kilojoules in

1000 kJ (a) 5 oranges?

4000 kJ (b) 20 oranges?

12 000 kJ (c) 60 oranges?

20 000 kJ (d) 100 oranges?

60 000 kJ (e) 300 oranges?



2. Mrs. Sherridan uses one spoonful of creamer in every cup of coffee.

If the creamer contained 40 kJ, how many kilojoules in

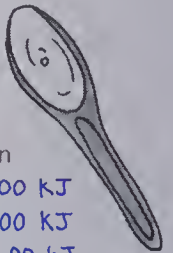
(a) 5 cups of coffee? 200 kJ

(b) 10 cups of coffee? 400 kJ

(c) 40 cups of coffee? 1600 kJ

(d) 100 cups of coffee? 4000 kJ

(e) 600 cups of coffee? 24 000 kJ



3. Most cupcakes contain about 800 kJ.

How many kilojoules in

6400 kJ (a) 8 cupcakes?

24 000 kJ (b) 30 cupcakes?

72 000 kJ (c) 90 cupcakes?

80 000 kJ (d) 100 cupcakes?

400 000 kJ (e) 500 cupcakes?



4. The average hot dog contains about 1000 kJ.

How many kilojoules in

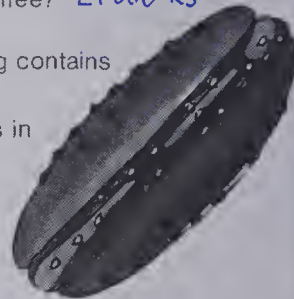
5000 kJ (a) 5 hot dogs?

20 000 kJ (b) 20 hot dogs?

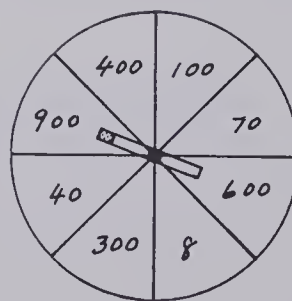
80 000 kJ (c) 80 hot dogs?

200 000 kJ (d) 200 hot dogs?

400 000 kJ (e) 400 hot dogs?



84 Multiplication of multiples of 10 and 100



Spin both spinners. Students then calculate the product of the two indicated numbers.

*Sample play* 700 and 40 are spun.  
 $700 \times 40 = 28\,000$

Use this activity for a whole class drill or select pairs of students to play.

Permit students to develop their own rules when playing in pairs. For example,

(a) greatest total score after five rounds wins;

(b) least score after five rounds wins;

(c) the player with the greatest single product wins;

(d) the player with the greatest difference between the greatest and the least single products wins.

2. Investigate the number of kilojoules in other foods. Booklets from the local health department often contain a wealth of information concerning foods and nutrition. Students might also explore the relationship between the calorie and the kilojoule. The results could be shared with the rest of the class.



## Supermarket Sale

Ultra-White detergent is on sale.

78 cases.

32 boxes of detergent in each case.

How many boxes altogether?

Multiply by ones.

$$\begin{array}{r} 78 \\ \times 32 \\ \hline 156 \end{array} \quad (2 \times 78)$$

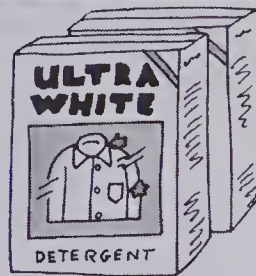
Multiply by tens.

$$\begin{array}{r} 78 \\ \times 32 \\ \hline 156 \\ 2340 \end{array} \quad (30 \times 78)$$

Add.

$$\begin{array}{r} 78 \\ \times 32 \\ \hline 156 \\ 2340 \\ \hline 2496 \end{array}$$

There are 2496 boxes altogether.



### Exercises

Complete.

$$\begin{array}{r} 37 \\ \times 25 \\ \hline 185 \end{array} \quad (5 \times 37)$$

$$\begin{array}{r} 740 \end{array} \quad (20 \times 37)$$

$$\begin{array}{r} 925 \end{array}$$

$$\begin{array}{r} 43 \\ \times 38 \\ \hline 344 \end{array} \quad (8 \times 43)$$

$$\begin{array}{r} 1290 \end{array} \quad (30 \times 43)$$

$$\begin{array}{r} 1634 \end{array}$$

$$\begin{array}{r} 50 \\ \times 19 \\ \hline 450 \end{array} \quad (9 \times 50)$$

$$\begin{array}{r} 500 \end{array} \quad (10 \times 50)$$

$$\begin{array}{r} 950 \end{array}$$

Multiply.

$$\begin{array}{r} 62 \\ \times 18 \\ \hline 1116 \end{array}$$

9.  $\begin{array}{r} 92 \\ \times 41 \\ \hline 3772 \end{array}$

★14.  $\begin{array}{r} 37 \\ \times 21 \\ \hline 777 \end{array}$

$$\begin{array}{r} 74 \\ \times 23 \\ \hline 1702 \end{array}$$

10.  $\begin{array}{r} 45 \\ \times 25 \\ \hline 1125 \end{array}$

★15.  $\begin{array}{r} 37 \\ \times 12 \\ \hline 444 \end{array}$

$$\begin{array}{r} 30 \\ \times 15 \\ \hline 450 \end{array}$$

11.  $\begin{array}{r} 67 \\ \times 43 \\ \hline 2881 \end{array}$

★16.  $\begin{array}{r} 37 \\ \times 18 \\ \hline 666 \end{array}$

$$\begin{array}{r} 28 \\ \times 21 \\ \hline 588 \end{array}$$

12.  $\begin{array}{r} 70 \\ \times 28 \\ \hline 1960 \end{array}$

★17.  $\begin{array}{r} 37 \\ \times 15 \\ \hline 555 \end{array}$

$$\begin{array}{r} 56 \\ \times 35 \\ \hline 1960 \end{array}$$

13.  $\begin{array}{r} 20 \\ \times 36 \\ \hline 720 \end{array}$

★18.  $\begin{array}{r} 37 \\ \times 24 \\ \hline 888 \end{array}$

Multiplication of two 2-digit factors 85

## OBJECTIVE

To multiply a 2-digit factor by a 2-digit factor

## PACING

Level A All  
Level B All  
Level C All

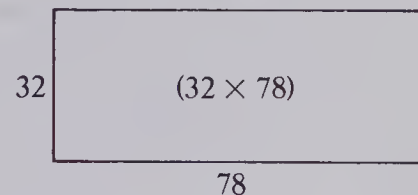
## RELATED AIDS

BFA COMP LAB II—37.

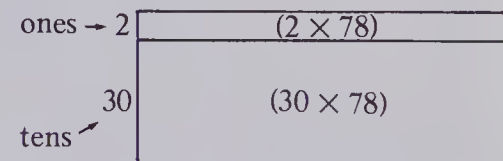
BFA PROB. SOLVING LAB II—77, 81.

## SUGGESTIONS

**Initial Activity** Provide a geometric model to accompany the example as shown in the display at the top of the pupil page. This would be consistent with the approach used on page 73 and would tend to reinforce the steps in the multiplication algorithm. For example,  $32 \times 78$  can be shown as an area model.



The next model illustrates that we can multiply by ones, then tens.



As well, the model explains why there is a zero (which is usually discarded in later grades) in the second partial product (2340). Students can see from the model that the multiplication statement is not  $3 \times 78 = 234$ , but rather  $30 \times 78 = 2340$ .

As you demonstrate the mechanical steps in the algorithm, you will want to make clear to students that  $3 \times 78$  is made equivalent to  $30 \times 78$  by indenting the partial product one space and annexing a zero.

$$\begin{array}{r} \text{(i)} \quad 78 \\ \times 32 \\ \hline 156 \\ 234 \end{array} \quad \begin{array}{r} \text{(ii)} \quad 78 \\ \times 32 \\ \hline 156 \\ 2340 \end{array} \quad \text{(annex zero)}$$

products? [Both are the same if no errors have been made!]

Ask students to make their own puzzles using different numbers in the boxes.

## USING THE BOOK

As you work through the example in the display, encourage students to deal mentally with the regrouping process; otherwise, regrouped digits must be "stacked" above the multiplicand.

$$\begin{array}{r} 2 \\ 1 \\ 78 \\ \times 32 \\ \hline 156 \\ 2340 \\ \hline 2496 \end{array}$$

You may want to complete Exercises 1 to 3 at the chalkboard, then assign Exercises 4 to 18 for independent work.

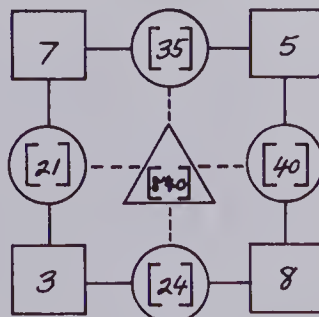
## ACTIVITIES

1. Some students may want to investigate more closely Exercises 14 to 18 and the resulting products. A perceptive student might notice that the multipliers are multiples of 3 (e.g., 21, 12, 18, 15, and 24). Using this as a basis, have students develop questions for the whole series in order.

$$\begin{array}{l} 37 \times 3 = 111 \\ 37 \times 6 = 222 \\ 37 \times 9 = 333 \\ 37 \times 12 = 444 \end{array}$$

$$\begin{array}{l} \bullet \\ \bullet \\ \bullet \\ 37 \times 27 = 999 \end{array}$$

2. Place this multiplication device on the chalkboard. This exercise is self-checking and a plentiful source for interesting multiplication drill.



Multiply the numbers in the boxes across and down and write the products in the circles. Multiply the numbers in the circles up and down and across.

What do you notice about the two

## OBJECTIVE

To multiply a 3-digit factor by a 2-digit factor

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

BFA COMPLAB II—41.  
CALC. W/BK—14.

## SUGGESTIONS

**Initial Activity** Review the process involved in multiplying 2-digit factors as shown on page 85 using an appropriate example such as  $63 \times 25$ . Then place an example such as the one in the pupil display on the chalkboard, emphasizing each step in the algorithm. Ask students to account for the zero in the second partial product, i.e., 29 720.

If some students are having difficulty with the placement of the second partial product, you may want to write the following series of questions on the chalkboard.

$\begin{array}{r} 26 \\ \times 11 \\ \hline 26 \\ 260 \\ \hline 286 \end{array}$	$\begin{array}{r} 26 \\ \times 22 \\ \hline 52 \\ 520 \\ \hline 572 \end{array}$	$\begin{array}{r} 26 \\ \times 33 \\ \hline 78 \\ 780 \\ \hline 858 \end{array}$	$\begin{array}{r} 26 \dots 26 \\ \times 44 \\ \hline 104 \\ 1040 \\ \hline 1144 \end{array}$	$\begin{array}{r} 26 \\ \times 99 \\ \hline 234 \\ 2340 \\ \hline 2574 \end{array}$
--	--	--	--	---

The series demonstrates how the second partial product is moved one place to the left with a zero annexed.

## USING THE BOOK

You may want to use Exercises 1 to 3 as a further class demonstration and then assign the remaining exercises for independent work. The answers for Exercises 1 to 5 are at the back of the pupil book.

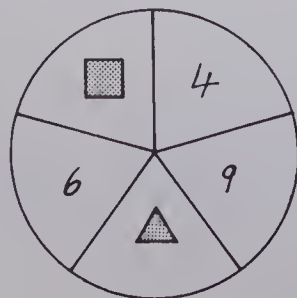
## ACTIVITIES

1. Challenge your students to find the "Mystery Products". Write these two examples on the chalkboard and then encourage students to construct their own.

*Examples*

Find the mystery products.

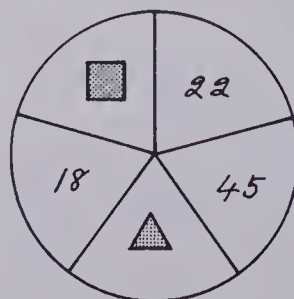
(a)



$$4 \times 9 = \blacktriangle [36]$$

$$[36] \blacktriangle \times 6 = \blacksquare [216]$$

(b)



$$22 \times 45 = \blacktriangle [990]$$

$$[990] \blacktriangle \times 18 = \blacksquare [17\ 820]$$

2. Some students might enjoy exploring the results of Exercises 15 to 18 in more detail. Have them try similar examples. Encourage students

## City Subway

Rush Hour!!

46 trips.

743 passengers for each trip.

How many passengers altogether?

Multiply by ones.

$$\begin{array}{r} 743 \\ \times 46 \\ \hline 4458 \end{array} \quad (6 \times 743)$$

Multiply by tens.

$$\begin{array}{r} 743 \\ \times 46 \\ \hline 4\ 458 \\ 29\ 720 \end{array} \quad (40 \times 743)$$

Add.

$$\begin{array}{r} 743 \\ \times 46 \\ \hline 4\ 458 \\ 29\ 720 \\ \hline 34\ 178 \end{array}$$

There were 34 178 passengers altogether.

Exercises

Complete.

$$\begin{array}{r} 472 \\ \times 36 \\ \hline 2832 \end{array} \quad \begin{array}{l} \blacksquare \blacksquare \blacksquare \blacksquare (6 \times 472) \\ 14\ 160 (30 \times 472) \\ \hline 16\ 992 \end{array}$$

$$\begin{array}{r} 293 \\ \times 53 \\ \hline 879 \end{array} \quad \begin{array}{l} \blacksquare \blacksquare \blacksquare \blacksquare (3 \times 293) \\ 14\ 650 (50 \times 293) \\ \hline 15\ 529 \end{array}$$

$$\begin{array}{r} 504 \\ \times 67 \\ \hline 3\ 528 \end{array} \quad \begin{array}{l} 7\ 504 \\ \times \blacksquare \blacksquare \blacksquare \blacksquare (60 \times 504) \\ \hline 30\ 240 \end{array}$$

Multiply.

$$\begin{array}{r} 326 \\ \times 24 \\ \hline 7824 \end{array}$$

$$\begin{array}{r} 407 \\ \times 32 \\ \hline 13\ 024 \end{array}$$

$$\begin{array}{r} 812 \\ \times 16 \\ \hline 12\ 992 \end{array}$$

$$\begin{array}{r} 281 \\ \times 26 \\ \hline 7306 \end{array}$$

$$\begin{array}{r} 540 \\ \times 12 \\ \hline 6480 \end{array}$$

$$\begin{array}{r} 367 \\ \times 35 \\ \hline 12\ 845 \end{array}$$

$$\begin{array}{r} 721 \\ \times 47 \\ \hline 33\ 887 \end{array}$$

$$\begin{array}{r} 551 \\ \times 62 \\ \hline 34\ 162 \end{array}$$

$$\begin{array}{r} 603 \\ \times 14 \\ \hline 8442 \end{array}$$

$$\begin{array}{r} 428 \\ \times 33 \\ \hline 14\ 124 \end{array}$$

$$\begin{array}{r} 333 \\ \times 66 \\ \hline 21\ 978 \end{array}$$

$$\begin{array}{r} 101 \\ \times 55 \\ \hline 5555 \end{array}$$

$$\begin{array}{r} 101 \\ \times 39 \\ \hline 3939 \end{array}$$

$$\begin{array}{r} 1001 \\ \times 62 \\ \hline 62\ 062 \end{array}$$

$$\begin{array}{r} 10\ 101 \\ \times 34 \\ \hline 343\ 434 \end{array}$$

86 Multiplication of a 3-digit factor by a 2-digit factor

to explain why the products contain sets of repeated digits.

*Example*

$$\begin{aligned} 101 \times 36 &= (100 \times 36) + (1 \times 36) \\ &= 3600 + 36 \\ &= 3636 \end{aligned}$$

3. Students might benefit from drill using various operations. Provide a table like this one

●	9	7	10	14	26	35
▲	4	3	5	7	15	26
● + ▲	[13]	[10]	[15]	[21]	[41]	[61]
● - ▲	[5]	[4]	[5]	[7]	[11]	[9]
● × ▲	[36]	[21]	[50]	[98]	[390]	[910]



## Estimation

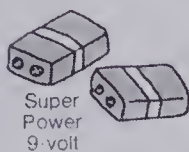
21 cartons of transistor batteries.  
68 batteries in each carton.  
How many batteries altogether?

Estimate:  
 $21 \times 68$

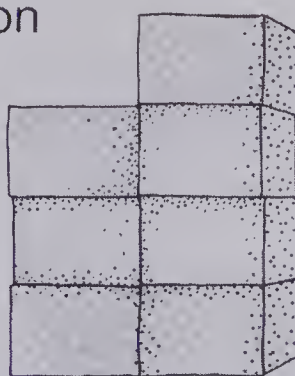
Round both factors:  $20 \times 70$

Think:  $20 \times 70 = 1400$

About 1400 batteries.



then



Calculate:  
Write  $68$   
 $\times 21$   
-----  
 $68$   
 $1360$   
-----  
 $1428$

There are 1428 batteries.

Is the written answer reasonable?

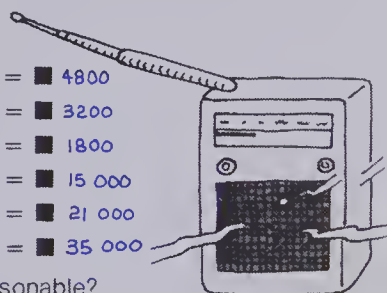
## Exercises

Copy and complete these estimates.

To estimate

- |                    |   |                         |
|--------------------|---|-------------------------|
| 1. $63 \times 77$  | → | $60 \times 80 = 4800$   |
| 2. $78 \times 42$  | → | $80 \times 40 = 3200$   |
| 3. $32 \times 61$  | → | $30 \times 60 = 1800$   |
| 4. $31 \times 488$ | → | $30 \times 500 = 15000$ |
| 5. $25 \times 703$ | → | $30 \times 700 = 21000$ |
| 6. $48 \times 675$ | → | $50 \times 700 = 35000$ |

Think:



Estimate first, then multiply. Are your calculated answers reasonable?

- |  |   |  |  |   |
|--|---|--|--|---|
| 7. $56 \times 21$ About 1200.<br>$\begin{array}{r} 1176 \end{array}$     | 8. $28 \times 17$ About 600.<br>$\begin{array}{r} 476 \end{array}$    | 9. $462 \times 26$ About 15000.<br>$\begin{array}{r} 12012 \end{array}$  | 10. $608 \times 37$ About 24000.<br>$\begin{array}{r} 22496 \end{array}$ | 11. $85 \times 43$ About 3600.<br>$\begin{array}{r} 3655 \end{array}$     |
| 12. $265 \times 71$ About 21000.<br>$\begin{array}{r} 18815 \end{array}$ | 13. $55 \times 13$ About 600.<br>$\begin{array}{r} 715 \end{array}$   | 14. $72 \times 43$ About 2800.<br>$\begin{array}{r} 3096 \end{array}$    | 15. $666 \times 12$ About 7000.<br>$\begin{array}{r} 7992 \end{array}$   | 16. $409 \times 25$ About 12000.<br>$\begin{array}{r} 10225 \end{array}$  |
| 17. $815 \times 62$ About 48000.<br>$\begin{array}{r} 50530 \end{array}$ | 18. $77 \times 56$ About 4800.<br>$\begin{array}{r} 4312 \end{array}$ | 19. $320 \times 81$ About 24000.<br>$\begin{array}{r} 25920 \end{array}$ | 20. $99 \times 47$ About 5000.<br>$\begin{array}{r} 4653 \end{array}$    | 21. $999 \times 99$ About 100000.<br>$\begin{array}{r} 98901 \end{array}$ |

Estimation of products 87

## OBJECTIVE

To estimate the product of 2- and 3-digit factors and a 2-digit factor

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

transistor batteries

## RELATED AIDS

CALC. W/BK—17.

## SUGGESTIONS

**Initial Activity** If you feel a review is necessary, consider the following skills needed for estimation:

1. rounding off;
2. multiplying where factors are multiples of 10;
3. a good grasp of basic facts.

**Example**

$70 \times 30$

Since  $7 \times 3 = 21$ ,

then  $70 \times 30 = 2100$ .

It might be appropriate to provide oral drill with questions similar to those in Exercises 1 to 6.

$52 \times 79 \rightarrow 50 \times 80$

Also include examples where the numeral 5 occurs in the one's place.

$65 \times 22 \rightarrow 70 \times 20$

## USING THE BOOK

You may want to use Exercises 1 to 6 as an oral exercise and then assign Exercises 7 to 21 for independent work.

## ACTIVITIES

1. Students might benefit from extra practice with rounding and estimation. Write number pairs on the chalkboard and provide these instructions.

**Example**

Round each number in the pair mentally, then multiply.

(a) (24, 85)  $\rightarrow 20 \times 90 = 1800$

(b) (36, 17)  $\rightarrow$

(c) (41, 286)  $\rightarrow$

(d) (55, 318)  $\rightarrow$

2. Explore the patterns made by 99 and 999. Have students calculate the first four products, then use the pattern to predict the remaining products. The

products could be checked by calculator.

- |                       |                         |
|-----------------------|-------------------------|
| $99 \times 21 = 2079$ | $999 \times 21 = 20979$ |
| $99 \times 22 = 2178$ | $999 \times 22 = 21978$ |
| $99 \times 23 = 2277$ | $999 \times 23 = 22977$ |
| $99 \times 24 = 2376$ | $999 \times 24 = 23976$ |
| $99 \times 25 = 2475$ | $999 \times 25 = 24975$ |

•  
•  
•

•  
•  
•

$99 \times 30 = 2970$   $999 \times 30 = 29970$

Encourage students to investigate multiplication of other factors by 99 and 999. Calculators should be provided for this activity. The objective is to increase the pupils' awareness of

patterns rather than to practise the multiplication algorithm.

3. Ask some students to investigate the Unitate Method for checking multiplication. The procedures could be shared with the rest of the class later.

$$\begin{array}{r} 382 \longrightarrow 13 \longrightarrow 4 \\ \times 26 \longrightarrow \times 8 \\ \hline 2292 \\ 7640 \\ \hline 9932 \longrightarrow 23 \longrightarrow 5 \end{array}$$

- (a) Sum the digits of the multiplicand and the multiplier. [The sums are 4 and 8.]
- (b) Multiply the two numbers and sum the digits of the product. [5]
- (c) Sum the digits of the product you wish to check. [5]
- (d) If this number equals the number produced in (b), the product is correct! [5 = 5]



## OBJECTIVE

To multiply a 3-digit factor by a 3-digit factor

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

HMS—DM20.  
BFA COMPLAB II—41.

## SUGGESTIONS

**Initial Activity** To introduce this lesson, write the following multiplication questions on the chalkboard. Student volunteers could work at the board while the others work independently at their desks. The questions use simple facts, and at the same time, vividly demonstrate the placement of the partial products.

(a) $\begin{array}{r} 123 \\ \times 111 \\ \hline 123 \\ 1230 \\ 12300 \\ \hline 13653 \end{array}$	(b) $\begin{array}{r} 123 \\ \times 222 \\ \hline 246 \\ 2460 \\ 24600 \\ \hline 27306 \end{array}$	(c) $\begin{array}{r} 123 \\ \times 333 \\ \hline 369 \\ 3690 \\ 36900 \\ \hline 40959 \end{array}$	(d) $\begin{array}{r} 123 \\ \times 444 \\ \hline 492 \\ 4920 \\ 49200 \\ \hline 54732 \end{array}$
---	---	---	---

Write the example as shown in the pupil display on the chalkboard and demonstrate the four steps.

## USING THE BOOK

Note that Exercises 6 to 10 use 1-digit multipliers and that Exercises 11 to 15 use 2-digit multipliers. You may want to assign them immediately or reserve them for a later time for those students who require extra practice.

## ACTIVITIES

1. Students might enjoy playing "Card Products" (two to four players). Remove the tens, jacks, queens, and kings from a deck of ordinary playing cards. Aces count as 1 (one).

- Shuffle the deck and place face down.
- The first player draws two cards and multiplies the numbers shown on the cards. For example,  
 $3 \times 8 = 24$   
The product is that player's score for the first round.
- The round continues for other players.
- The player with the greatest total score after four rounds is the winner.

**Variations:** Each player draws four cards in turn. The cards are used to make two, 2-digit numbers. Round off

## The Gallery

The Gallery displays work by different artists. The gallery is open 256 d (days) a year. About 431 people attend every day. About how many people attend altogether?



Multiply by ones.

$$\begin{array}{r} 431 \\ \times 256 \\ \hline 2586 \end{array}$$

Multiply by tens.

$$\begin{array}{r} 431 \\ \times 256 \\ \hline 2586 \\ 21550 \end{array}$$

Multiply by hundreds.

$$\begin{array}{r} 431 \\ \times 256 \\ \hline 2586 \\ 21550 \\ 86200 \end{array}$$

Add.

$$\begin{array}{r} 431 \\ \times 256 \\ \hline 2586 \\ 21550 \\ 86200 \\ \hline 110336 \end{array}$$

About 110 336 people attended.

### Exercises

Multiply.

1. $\begin{array}{r} 232 \\ \times 145 \\ \hline 33640 \end{array}$	2. $\begin{array}{r} 116 \\ \times 231 \\ \hline 26796 \end{array}$	3. $\begin{array}{r} 307 \\ \times 245 \\ \hline 75215 \end{array}$	4. $\begin{array}{r} 290 \\ \times 118 \\ \hline 34220 \end{array}$	5. $\begin{array}{r} 319 \\ \times 156 \\ \hline 49764 \end{array}$
6. $\begin{array}{r} 406 \\ \times 8 \\ \hline 3248 \end{array}$	7. $\begin{array}{r} 517 \\ \times 6 \\ \hline 3102 \end{array}$	8. $\begin{array}{r} 2038 \\ \times 5 \\ \hline 10190 \end{array}$	9. $\begin{array}{r} 3172 \\ \times 4 \\ \hline 12688 \end{array}$	10. $\begin{array}{r} 28160 \\ \times 7 \\ \hline 197120 \end{array}$
11. $\begin{array}{r} 521 \\ \times 24 \\ \hline 12504 \end{array}$	12. $\begin{array}{r} 409 \\ \times 35 \\ \hline 14315 \end{array}$	13. $\begin{array}{r} 3712 \\ \times 14 \\ \hline 51968 \end{array}$	14. $\begin{array}{r} 6291 \\ \times 25 \\ \hline 157275 \end{array}$	15. $\begin{array}{r} 20735 \\ \times 31 \\ \hline 642785 \end{array}$
16. $\begin{array}{r} 418 \\ \times 125 \\ \hline 52250 \end{array}$	17. $\begin{array}{r} 170 \\ \times 219 \\ \hline 37230 \end{array}$	18. $\begin{array}{r} 509 \\ \times 362 \\ \hline 184258 \end{array}$	19. $\begin{array}{r} 611 \\ \times 245 \\ \hline 149695 \end{array}$	20. $\begin{array}{r} 760 \\ \times 461 \\ \hline 350360 \end{array}$

88 Multiplication, 3-digit factors and practice

the numbers to the nearest multiple of ten and multiply. The player with the greatest product wins.

**Sample play.** Cards drawn:

$$\begin{array}{|c|c|c|c|} \hline 6 & 8 & 1 & 3 \\ \hline \end{array} \quad 81 \times 63 \longrightarrow 80 \times 60 = 4800$$

Continue as above, but least product in the round wins. (You may want to discuss with students the various strategies which could be used in these variations.)

2. Complete the "Multiplication Boxes". Encourage students to create their own and exchange with classmates.

8	5	[40]
3	7	[21]
[24]	[35]	?

[840]

23	18	[414]
15	29	[435]
[345]	[522]	?

[180 090]

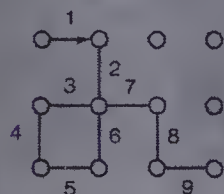
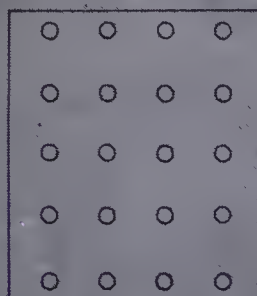
- Multiply across.
- Multiply down.
- Multiply the products across and down.
- What do you notice about the final two products?  
[The products are the same if no errors have been made.]

## Tune Up

Multiply

- |  |  |  |  |  |
|--|--|--|--|--|
| 1. $\begin{array}{r} 68 \\ \times 23 \\ \hline 1564 \\ 07 \\ \hline \end{array}$       | 2. $\begin{array}{r} 503 \\ \times 6 \\ \hline 3018 \\ 765 \\ \hline \end{array}$        | 3. $\begin{array}{r} 2674 \\ \times 8 \\ \hline 21392 \\ 8456 \\ \hline \end{array}$       | 4. $\begin{array}{r} 56 \\ \times 48 \\ \hline 2688 \\ 7532 \\ \hline \end{array}$           | 5. $\begin{array}{r} 671 \\ \times 38 \\ \hline 25498 \\ 6011 \\ \hline \end{array}$         |
| 6. $\begin{array}{r} 5.6 \\ \times 8 \\ \hline 44.8 \\ \hline \end{array}$             | 7. $\begin{array}{r} 3018 \\ \times 9 \\ \hline 27162 \\ 765 \\ \hline \end{array}$      | 8. $\begin{array}{r} 21392 \\ \times 6 \\ \hline 128352 \\ 8456 \\ \hline \end{array}$     | 9. $\begin{array}{r} 2688 \\ \times 8 \\ \hline 21504 \\ 7532 \\ \hline \end{array}$         | 10. $\begin{array}{r} 25498 \\ \times 6 \\ \hline 152988 \\ 6011 \\ \hline \end{array}$      |
| 11. $\begin{array}{r} 5.6 \\ \times 68 \\ \hline 380.8 \\ 96220 \\ \hline \end{array}$ | 12. $\begin{array}{r} 688.5 \\ \times 245 \\ \hline 169695 \\ 611 \\ \hline \end{array}$ | 13. $\begin{array}{r} 507.36 \\ \times 54 \\ \hline 27397.44 \\ 777 \\ \hline \end{array}$ | 14. $\begin{array}{r} 60.256 \\ \times 501 \\ \hline 30288.256 \\ 999 \\ \hline \end{array}$ | 15. $\begin{array}{r} 36.066 \\ \times 645 \\ \hline 23262.57 \\ 7413 \\ \hline \end{array}$ |

## BRAINTICKLER



Copy this grid into your notebook.

- Start at any circle. Connect with other circles. Complete as many *squares* as possible.
- BE CAREFUL!  
You may not lift your pencil from the paper.  
You may not retrace or cross any lines.
- When no further moves can be made, the game is ended.
- Score:  
4 points for each completed square.  
3 points for each 3-sided connection.  
2 points for each 2-sided connection.

The player in the example has made 14 points so far.

- |                       |                 |
|-----------------------|-----------------|
| 1 square              | — 4 points      |
| 2 3-sided connections | — 6 points      |
| 2 2-sided connections | — 4 points      |
|                       | <hr/> 14 points |

What's your  
highest score?

Multiplication practice, activities 89

## OBJECTIVE

To practise multiplication skills developed to date

## PACING

Level A All  
Level B All  
Level C All

## USING THE BOOK

The Tune Up contains a selection of multiplication questions taught so far. You may want immediately to use the exercises as a review for all students. Or, the exercises could be used just with those students whom you believe would benefit from such a review. These exercises could also be reserved for review at a later date.

The Tune Up could be used as an informal diagnostic test. Students who have obvious difficulty with some exercises may require reteaching. Alternatively, you may want to refer these students to the appropriate page in the text. The exercise number and the appropriate textbook page for that particular skill are listed here.

Exercise	Page
1	85
2	74
3	75
4	85
5	86
6	77
7	78
8	79
9	82
10	82
11	86
12	88
13	86
14	88
15	88

The Braintickler is an activity designed for pairs of students. Multiple copies of the grid could be made so that students can complete a number of games. Some students may want, after a few games, to increase the size of the grid from a  $4 \times 5$  to  $5 \times 5$ ,  $6 \times 5$ , and so on.



## OBJECTIVES

To solve word problems using multiplication skills developed to date  
To solve word problems using addition and subtraction skills

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

untreated leather, propellers, industrial diamonds, iron ore, newsprint, sub-compact cars, electronic parts, transistor radios, typewriters, steel ingots

## RELATED AIDS

HMS—DM21.

## SUGGESTIONS

**Initial Activity** Use the Career Awareness section in the Chapter Overview as the basis for discussion of these pages with the class. If you live near a fresh water or salt water port, you might want to invite someone who works in a dockyard to speak to the students.

If you think necessary, review the format you have established for problem solving.

## USING THE BOOK

You may wish to read through all of the word problems together to ensure that reading abilities don't further complicate the exercises (see the Vocabulary).

The Exercises on page 90 involve multiplication only. The Exercises on page 91 involve mixed operations.

(i) Exercises 6, 7, 9, and 13 — multiplication.

(ii) Exercises 8 and 11 — addition.

(iii) Exercises 10 and 12 — subtraction.

As well, Exercises 8 and 10 contain extra (unnecessary) information. You may want to make students aware of this in a general sense without stating which exercises are involved.

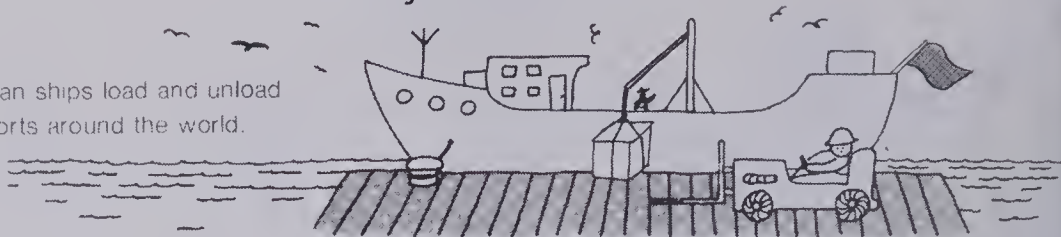
## ACTIVITIES

1. Some students might enjoy learning more about ships and the world of shipping by referring to the *World Almanac*, *Book of Facts*, the *Guinness Book of World Records*, or other reference books. Students could create word problems about tonnage, size of ships, speed, longest trips, and so on.

2. Word problems could be created using other themes of the

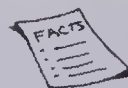
## Dockyard Workers

Ocean ships load and unload at ports around the world.

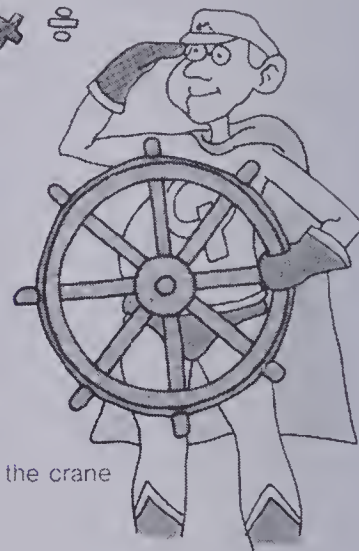


### Exercises

Solve these problems. Remember to answer Professor Q's four questions *mentally*



1. The ship *Tarfala* unloaded 64 tractor wheels.  
Each wheel had a mass of 92 kg.  
What was the total mass of all the wheels? **5888 kg**
2. Dockyard workers loaded 35 cases of cheese.  
Each case contained 256 blocks.  
How many blocks of cheese were loaded altogether? **8960**
3. The *Kimi Maru* has just unloaded 560 bags of rice.  
Each bag has a mass of 47 kg.  
Find the total mass of the rice. **26 320 kg**
4. A worker unhooked 9 bundles of untreated leather from the crane.  
Each bundle was worth \$82.79.  
What was the total value of the leather? **\$745.11**
5. The *Benalder* is carrying 26 cases of aircraft propellers for a Halifax company.  
Each case holds 14 propellers.  
How many propellers is the *Benalder* carrying altogether? **364**





6. Captain Benson has 8 packages of industrial diamonds in the ship's safe.  
Each package is worth \$975.80.  
What is the total value of the diamonds? **\$ 7806.40**
7. The crane operator of the Cardigan Bay loaded 47 carloads of iron ore.  
The ore from each car had a mass of 22 t.  
How many tonnes were loaded altogether on the ship? **1034 t**
8. The ship Aquarius delivered 176 rolls of newsprint to Tacoma Harbour and 195 rolls to Frederick Bay.  
Each roll has a mass of 2 t.  
How many rolls of newsprint were delivered altogether? **371**
9. Shipworkers built 18 special sections on the ship Gastrana.  
Each section holds 25 subcompact cars.  
How many cars will the Gastrana carry? **450**
10. Workers stored 16 206 bags of coffee beans in the warehouse.  
12 948 bags were loaded onto the freighter North Star.  
Each bag has a mass of 45 kg  
How many bags of coffee beans were left in the warehouse? **3258**
11. The delivery manager is putting together an order for electronic parts.  
35 cartons were loaded onto a truck, 47 cartons were sitting on the dock,  
and 54 cartons were sitting on the freighter Kamakura.  
How many cartons of electronic parts were there altogether? **136**
12. A company paid \$6759.00 for a shipment of transistor radios and \$9200.00 for a shipment of electric typewriters.  
How much more did the company pay for the electric typewriters? **\$ 2441.00**
13. The crane operator carefully loaded 6 racks of steel ingots on the deck of the Selandia.  
Each rack had a mass of 983 kg.  
What was the total mass of the racks? **5898 kg**



Problems: mixed operations 91

students' choice. Initially, you may want to provide some structure for the students.

#### Example

Create a word problem whose solution requires the number phrase  $24 \times 6$ . A more unstructured approach could be used later.

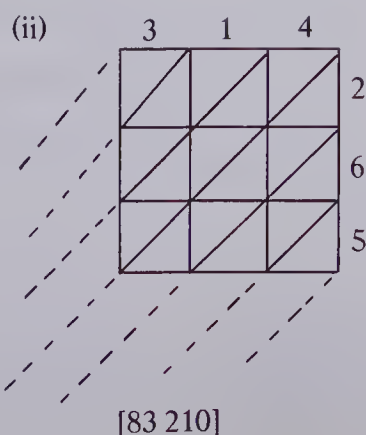
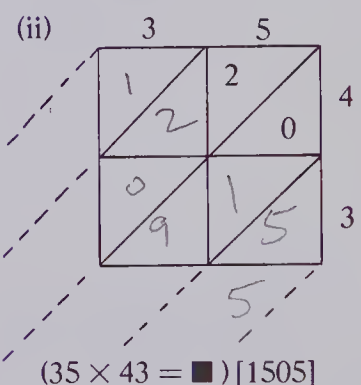
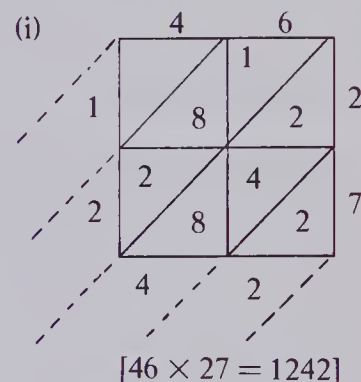
#### Example

Create a word problem whose solution requires the numbers 24 and 6, and one of the operations of addition, subtraction, or multiplication.

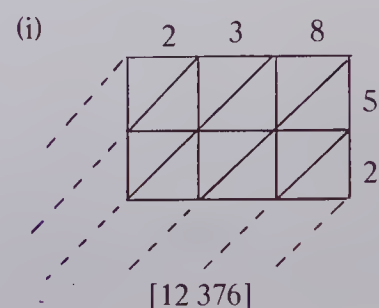
Ask students to provide answers for their word problems. Once you have checked the problems, they could be placed in a problem-solving file, or individual problems could be displayed periodically at a problem-solving centre.

3. Students and adults are often intrigued by algorithms used by people hundreds of years ago. "Lattice" multiplication is one such algorithm. Use the diagrams as illustrated to promote a different, but legitimate, form of problem solving.

(a) This is how people used to multiply  $46 \times 27$ . Decide how it works, then complete the unfinished diagram.



(b) Try these, then make your own and share your results with a classmate.

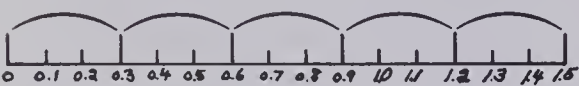


**OBJECTIVE**  
To multiply a 2-digit whole number by a decimal (tenths)

**PACING**  
Level A All  
Level B All  
Level C All

**RELATED AIDS**  
CALC. W/BK—51.

**SUGGESTIONS**  
**Initial Activity** When we multiply, we generally expect the product to be greater than either of the two factors. This doesn't hold true, however, when one of the factors is a decimal less than one. You might want to demonstrate this by using a number line.  
*Example*  
 $0.3 \times 5 = 1.5$  (or 5 sets of 0.3)



Alternatively, you may want to use a diagram related to a specific word problem.  
*Example*  
The track is 0.5 km long. How far would Alec travel in 7 laps?

Laps	1	2	3	4	5	6	7
Distance	0.5	1	1.5	2	2.5	3	3.5

$0.5 \times 7 = 3.5$   
Alec travelled 3.5 km.  
Estimation skills can still be applied if you wish.  
*Example*  
 $0.7 \times 28 = 19.6$

*Think:*

Since  $7 \times 30 = 210$ ,  
then  $0.7 \times 30 = 21.0$  or 21.  
Therefore, 19.6 is a reasonable answer.  
Some students may modify the estimation procedures.  
*Example*  
 $0.8 \times 37 = 29.6$   
*Think:*  
 $1 \times 37 = 37$   
Since  $0.8 < 1$ ,  
then the product of  $0.8 \times 37$  must be less than 37.  
Therefore, 29.6 is a reasonable answer.

**Go-Karts**

The go-kart track at Milton Beach is 0.5 km long.  
How far would Patrick travel in 13 laps?

Multiply.

$$\begin{array}{r} 0.5 \\ \times 13 \\ \hline 15 \\ 50 \\ \hline 6.5 \end{array}$$

How many decimal places?

Patrick uses this simpler form!

$$\begin{array}{r} 13 \\ \times 0.5 \\ \hline 6.5 \end{array}$$



Patrick would travel 6.5 km.

**Exercises**

Find the distances travelled by:

Kathleen	John	Sandy	Michael	Kim
1. $\begin{array}{r} 17 \\ \times 0.5 \\ \hline 8.5 \end{array}$	2. $\begin{array}{r} 35 \\ \times 0.5 \\ \hline 17.5 \end{array}$	3. $\begin{array}{r} 41 \\ \times 0.5 \\ \hline 20.5 \end{array}$	4. $\begin{array}{r} 23 \\ \times 0.5 \\ \hline 11.5 \end{array}$	5. $\begin{array}{r} 29 \\ \times 0.5 \\ \hline 14.5 \end{array}$
6. $\begin{array}{r} 32 \\ \times 0.6 \\ \hline 19.2 \end{array}$	7. $\begin{array}{r} 56 \\ \times 0.2 \\ \hline 11.2 \end{array}$	8. $\begin{array}{r} 40 \\ \times 0.3 \\ \hline 12.0 \end{array}$	9. $\begin{array}{r} 64 \\ \times 0.8 \\ \hline 51.2 \end{array}$	10. $\begin{array}{r} 21 \\ \times 0.5 \\ \hline 10.5 \end{array}$
11. $\begin{array}{r} 73 \\ \times 0.2 \\ \hline 14.6 \end{array}$	12. $\begin{array}{r} 85 \\ \times 0.1 \\ \hline 8.5 \end{array}$	13. $\begin{array}{r} 19 \\ \times 0.9 \\ \hline 17.1 \end{array}$	14. $\begin{array}{r} 36 \\ \times 0.7 \\ \hline 25.2 \end{array}$	15. $\begin{array}{r} 68 \\ \times 0.6 \\ \hline 40.8 \end{array}$

Solve.

16. Track — 0.4 km long  
Laps — 35  
Total distance? **14.0 km**
17. Track — 0.6 km long  
Laps — 42  
Total distance? **25.2 km**

92 Multiplication of a 2-digit whole number by a 1-digit decimal (tenths)

**USING THE BOOK**

Read through the display at the top of the pupil page relating what is shown there to what was discussed during the Initial Activity.

Pupils should be aware that in Exercise 8, ( $0.3 \times 40 = 12.0$ ), 12.0 is equal to 12.

**ACTIVITIES**

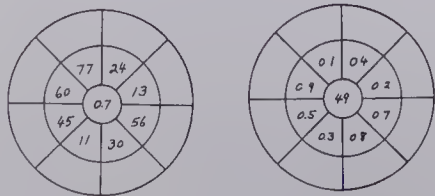
1. Some students may wish to create their own mini-stories based on the Go-Kart theme. These could be shared with other students.

*Examples*

- (a) Track is 0.4 km long. Susan drives 35 laps. Total distance?  
(b) Track is 0.6 km long. Allen drives 42 laps. Total distance?

2. Provide, or have students create, appropriate drill wheels.

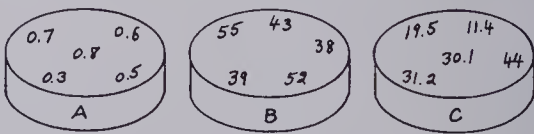
*Examples*



3. Challenge your students with "Pots and Products". Draw the following diagrams on the chalkboard and have students copy them. Encourage students to develop some strategy (e.g., estimation) rather than blind trial and error.

*Example*

Find factors in Pot A and Pot B that will give a product in Pot C.



$$\begin{array}{l} 0.3 \times 38 = 11.4 \\ 0.5 \times 39 = 19.5 \\ 0.6 \times 52 = 31.2 \end{array} \quad \begin{array}{l} 0.7 \times 43 = 30.1 \\ 0.8 \times 55 = 44 \end{array}$$

Some students may wish to create their own "Pots and Products". You will want to provide calculators for this activity. Ask students to draw the "Pots" on one side of a piece of paper or on a large file card, and write the answers on the reverse side. The finished results could be used periodically at the problem-solving centre.



## Chair Lift

The chair lift carries skiers to the top of the ski slope.

Each trip is 0.9 km one way.

How many kilometres would a chair have travelled after 145 trips?

$$\begin{array}{r} \text{Multiply.} \quad 145 \\ \times 0.9 \\ \hline 130.5 \end{array}$$

A chair would have travelled 130.5 km.



### Exercises

Multiply.

- |                              |                               |                                |                               |                                |
|------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|
| 1. $371 \times 0.6 = 222.6$  | 2. $2162 \times 0.7 = 1513.4$ | 3. $508 \times 0.3 = 152.4$    | 4. $4928 \times 0.5 = 2464.0$ | 5. $1471 \times 0.2 = 294.2$   |
| 6. $713 \times 0.4 = 285.2$  | 7. $2051 \times 0.8 = 1640.8$ | 8. $7406 \times 0.3 = 2221.8$  | 9. $910 \times 0.7 = 637.0$   | 10. $4682 \times 0.9 = 4213.8$ |
| 11. $801 \times 0.8 = 640.8$ | 12. $333 \times 0.6 = 199.8$  | 13. $5026 \times 0.4 = 2010.4$ | 14. $1978 \times 0.2 = 395.6$ | 15. $6244 \times 0.7 = 4370.8$ |

16. Complete this maintenance sheet for the chair lift.

	Maintenance	Number of Trips	Distance in Kilometres
(a)	Grease gears at	120	$0.9 \times 120 = 108 \text{ km}$
(b)	Check safety brakes at	580	$0.9 \times 580 = 522 \text{ km}$
(c)	Inspect cable at	860	$0.9 \times 860 = 774 \text{ km}$
(d)	Test controls at	2570	$0.9 \times 2570 = 2313 \text{ km}$
(e)	Tune engine at	4750	$0.9 \times 4750 = 4275 \text{ km}$
(f)	Adjust wheels at	8640	$0.9 \times 8640 = 7776 \text{ km}$

Multiplication of a 3-digit whole number by a 1-digit decimal (tenths) 93

## OBJECTIVE

To multiply 3- and 4-digit whole numbers by a decimal (tenths)

## PACING

Level A All  
Level B All  
Level C All

## SUGGESTIONS

**Initial Activity** Review the procedure involved in multiplying a 2-digit whole number by tenths as presented on page 92. Remind students that the number of decimal places in the factors affects the number of decimal places in the product. Then present them with examples of 3-digit numbers being multiplied by tenths: e.g.,  $312 \times 0.6$ ,  $426 \times 0.4$ , and so on. Follow this with 4-digit multiplicands: e.g.,  $4134 \times 0.7$ ,  $6421 \times 0.2$ , and so on. Point out that the multiplication procedure remains the same despite the magnitude of the numbers involved and that the products are actually *less* than the original multiplicand because the multipliers themselves are less than one. If this requires further explanation, you may wish to repeat the number line demonstration described in the Initial Activity section for page 92.

## USING THE BOOK

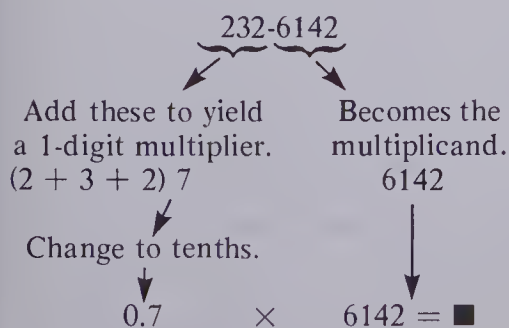
You may want to use Exercise 16 as a chalkboard demonstration to review the multiplication algorithm and placement of the decimal point. Or, students can work independently. Check the answers before proceeding to Exercises 1 to 15. (If a calculator is available, a student volunteer could enter the factors and call out the correct products.)

## ACTIVITIES

1. Provide some telephone books and scrap paper so that pairs of pupils can play "Phone Book". The first player opens the phone book to any page, shields his or her eyes, and randomly selects any phone number on the page. The second player uses that number as follows to complete a 4-digit by tenths multiplication exercise.

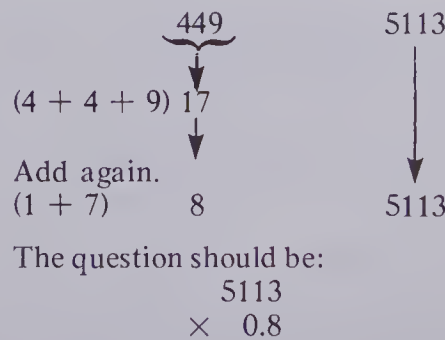
**Example**

Phone number selected



When computation is complete, players change roles. The player with the greatest product wins the round. The first player to win three rounds is the series winner.

**Note:** Show students what to do when the first three numbers total more than nine.



2. See the "Input-Output" game in the Activity Reservoir. Use rule strips such as "multiply by 0.6" and

appropriately labelled input strips (i.e., 2-, 3-, and 4-digit whole numbers) to make the game relevant to this lesson.



# OBJECTIVE

To multiply a decimal by a decimal (tenths)

**PACING**

Level A All  
 Level B All  
 Level C All

# SUGGESTIONS

**Initial Activity** You may want to consider this page (and page 95) as an opportunity for individual or small-group exploration. Most students, using past work as a basis, should be able to identify the pattern in the display and be able to develop a rule for the placement of the decimal point.

If you think that students require further reinforcement of the pattern before starting independent work, you may want to consider the use of calculators. If available, provide one calculator for each group.

Instruct students in the use of the constant function. On most calculators, the second factor is the constant. (Some machines use the first factor as a constant. You will want to check your calculators before attempting this activity.)

Have one student in each group enter the factors which you have written on the chalkboard. Ask a second student to record the products in the display. Encourage students to discuss the results.

*Example*  
 147 × 0.3

	Enter	Display
(i)	$\boxed{1}\boxed{4}\boxed{7}\boxed{\times}\boxed{.}\boxed{3}\boxed{=}$	44.1
	(The constant 0.3 does not have to be entered again.)	
(ii)	$\boxed{1}\boxed{4}\boxed{.}\boxed{7}\boxed{=}$	4.41
(iii)	$\boxed{1}\boxed{.}\boxed{4}\boxed{7}\boxed{=}$	0.441

Because the constant function makes the generation of patterns quite simple, students may request that larger numbers be used. If so, encourage them to discover whether their rule about the placement of the decimal still applies.

# USING THE BOOK

Read through the display at the top of the page together. Point out that the numerals or the factors and products are the same but that the decimal places are changing.

Have someone answer the question

# Patterns With Decimal Factors

Investigate these patterns.

125	→	12.5	→	1.25
× 0.3	→	× 0.3	→	× 0.3
37.5		3.75		0.375

198	→	19.8	→	1.98
× 0.7	→	× 0.7	→	× 0.7
138.6		13.86		1.386

Find: The number of decimal places for each set of factors;  
 the number of decimal places in each product.

What rule helps you to find the number of decimal places in the product?

## Exercises

Complete these patterns.

1.	237	→	23.7	→	2.37
	× 0.4	→	× 0.4	→	× 0.4
	94.8		9.48		0.948

2.	293	→	29.3	→	2.93
	× 0.5	→	× 0.5	→	× 0.5
	146.5		14.65		1.465

Multiply. Use the rule.

3.	43.7	4.	1.36	5.	2.41	6.	2.39	7.	68.2
	× 0.5		× 0.2		× 0.4		× 0.9		× 0.3
	21.85		0.272		0.964		2.151		20.46
8.	1.49	9.	2.87	10.	3.51	11.	56.9	12.	1.99
	× 0.3		× 0.7		× 0.6		× 0.5		× 0.2
	0.447		2.009		2.106		28.45		0.398

Multiply.

13.	24.17	14.	3.642	15.	2.526	16.	418.3	17.	47.15
	× 0.2		× 0.4		× 0.3		× 0.4		× 0.5
	4.834		1.4568		0.7578		167.32		23.575
★ 18.	7.00	★ 19.	82.0	★ 20.	5.05	★ 21.	600	★ 22.	22.2
	× 0.3		× 0.5		× 0.4		× 0.5		× 0.5
	2.100		41.00		2.020		300.0		11.10

94 Multiplication of a decimal by a decimal (tenths)

in the box at the bottom of the display. You may wish to write the rule on the chalkboard as a reminder while the exercises are being completed. [The total number of decimal places in the factors equals the total number of decimal places in the product.]

Complete Exercises 1 and 2 orally (and, if necessary, Exercises 3, 4, 13, and 14 as a guide to format). Note that Exercises 18 to 22 contain products with zeros that can be discarded.

# ACTIVITIES

Some students may wish to explore other patterns in multiplication. Calculators could be provided to highlight the patterns and to lessen the mechanical work of calculation.

1. Multiply. Find the pattern. (The digits 1, 4, 2, 8, 5, 7 form cyclical products.)

142 857	142 857	142 857	142 857
× 1	× 2	× 3...×	× 6
[142 857]	[285 714]	[428 571]	[857 142]

2. Multiply these pairs and find the differences. What is the pattern? [Difference of 1]

- (i)  $3 \times 3 = 9$  (ii)  $4 \times 4 = 16$   
 $2 \times 4 = 8$   $3 \times 5 = 15$   
 (iii)  $5 \times 5 = \underline{\hspace{1cm}}$  (iv)  $6 \times 6 = \underline{\hspace{1cm}}$   
 $4 \times 6 = \underline{\hspace{1cm}}$   $5 \times 7 = \underline{\hspace{1cm}}$   
 (v)  $7 \times 7 = \underline{\hspace{1cm}}$   
 $6 \times 8 = \underline{\hspace{1cm}}$

3. Try these pairs. What is the pattern? [Difference of 1]

- (i)  $60 \times 60 = 3600$  (ii)  $70 \times 70 = \underline{\hspace{1cm}}$   
 $59 \times 61 = 3599$   $69 \times 71 = \underline{\hspace{1cm}}$   
 (iii)  $80 \times 80 = \underline{\hspace{1cm}}$  (iv)  $90 \times 90 = \underline{\hspace{1cm}}$   
 $79 \times 81 = \underline{\hspace{1cm}}$   $89 \times 91 = \underline{\hspace{1cm}}$

4. Can you find a quick mental method for finding these products?

- (a)  $11 \times 13$  [Think of  $12 \times 12 - 1$ .]  
 (b)  $49 \times 51$  [Think of  $50 \times 50 - 1$ .]  
 (c)  $39 \times 41$  [Think of  $40 \times 40 - 1$ .]  
 (d)  $29 \times 31$  [Think of  $30 \times 30 - 1$ .]  
 (e)  $19 \times 21$  [Think of  $20 \times 20 - 1$ .]

5. Choose a number from 1 to 9 (e.g., 6). Multiply by 9 ( $6 \times 9 = 54$ ). Multiply this number times the "magic" number 12 345 679. What is the result?

(Continued on page 95)

## More Patterns

Investigate this pattern.

256 × 0.31 ----- 256 7680 ----- 79.36	→	25.6 × 0.31 ----- 256 7680 ----- 7.936	→	2.56 × 0.31 ----- 256 7680 ----- 0.7936
---	---	--	---	---

Hint.  
Count the  
number of  
decimal places

What rule helps you to find the number of decimal places in the product?

### Exercises

Complete these patterns.

1. 146 × 0.21 ----- 146 2920 ----- 30.66	→	14.6 × 0.21 ----- 146 2920 ----- 3.066	→	1.46 × 0.21 ----- 146 2920 ----- 0.3066	2. 526 × 0.43 ----- 1 578 21 040 ----- 226.18	→	52.6 × 0.43 ----- 1 578 21 040 ----- 22.618	→	5.26 × 0.43 ----- 1 578 21 040 ----- 2.2618
--	---	--	---	---	---	---	---	---	---

Multiply. Use the rule.

1. 15.3 × 0.32 ----- 4.896	4. 2.14 × 0.13 ----- 0.2782	5. 4.08 × 0.12 ----- 0.4896	6. 32.7 × 0.22 ----- 7.194	7. 19.3 × 0.14 ----- 2.702
2. 4.17 × 0.62 ----- 2.5854	9. 53.6 × 0.54 ----- 28.944	10. 4.32 × 0.63 ----- 2.7216	11. 70.8 × 0.46 ----- 32.568	12. 2.19 × 0.77 ----- 1.6863

Multiply.

2.973 × 0.52 ----- 1.54596	14. 40.68 × 0.32 ----- 13.0176	15. 5124 × 0.23 ----- 1178.52	16. 3.705 × 0.46 ----- 1.70430
-------------------------------------	---	--	---

Multiplication of a decimal by a decimal (hundredths) 95

(Continued from page 94)

Choose another number from 1 to 9 and try again. What pattern develops? [The original number chosen is repeated in the product.]

$$\begin{array}{r} 12\ 345\ 679 \\ \times \quad 54 \\ \hline 49\ 382\ 716 \\ 617\ 283\ 950 \\ \hline 666\ 666\ 666 \end{array}$$

## ACTIVITIES

1. Provide a number of "fill-in-the-box" multiplication exercises such as these.

(a) 7.56 × 0.39 ----- 6 □ □ □ □ □ □ □ 0 ----- □.□ 3 □ □	(b) 12.4 × 0.28 ----- 9 □ □ 2 □ □ □ ----- □.□ 7 □ □
---	---

2. Provide numbered spinners, dice, and/or decks of cards numbered from 0 - 9 for students to use in generating random multiplication questions.

## OBJECTIVE

To multiply a decimal by a decimal (hundredths)

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

HMS—DM22.  
CALC. W/BK—48.

## SUGGESTIONS

**Initial Activity** Provide a "refresher course" in 3-digit whole number by 2-digit whole number multiplication (as presented on page 86) by working through three or four examples, ending with one such as  $256 \times 31$ . Then, review the processes, patterns, and number of decimal places rule as discussed on page 94. Once this is complete, show the procedure for multiplication of decimals by decimals using the same numerals that were used in the earlier 3-digit whole number by 2-digit whole number demonstration, i.e.,  $2.56 \times 0.31$ .

## USING THE BOOK

Go through the pupil display noting patterns and numbers of decimal places. Have someone identify the rule and note it on the chalkboard for use while completing the exercises. Point out that this is the same rule that applied on page 94. Complete Exercises 1 and 2 orally being certain to stress the use of the rule.

Assign the exercises.

$$\begin{array}{r} \square.\square\square \\ \times 0.\square\square \\ \hline \end{array}$$

For example, divide into groups of three. Have the first player use spinners, dice, or cards to place numerals in the boxes in the top row (i.e., multiplicand) of a blank game sheet as shown. The second player does likewise with the "multiplier" row. The third player computes. Players take turns in each role, each time taking the product as their score. The player with the greatest (or least, or closest to 5.000, etc.) score after all have tried each role once wins the round.



## OBJECTIVES

To restate word problems in simpler terms

To solve word problems

## PACING

Level A All

Level B All

Level C All

## VOCABULARY

gymnastics competition, backflip, routine, volleyball

## BACKGROUND

Many problems contain information that is both interesting and may help to place the problem in some context, but is not essential to the solution of the problem. Efficient problem solvers often restate a “wordy” problem in their own terms, discarding irrelevant information and concentrating on the basic facts.

## SUGGESTIONS

**Initial Activity** Write this problem on the chalkboard and ask students to pick out the important information. Suggest that this information could be recorded as a mini-story (e.g., see pages 80 to 81).

### Example

Kristen plays the violin. She saved enough money to buy a new case. At music camp she practised 6 h every day. Kristen attended music camp for 14 d. How many hours did she practise altogether?

Restated: 6 h practise each day.  
14 d. How many hours altogether?  $[6 \times 14 = 84]$

In keeping with the problem-solving format you have established, you may want students to write a full statement that answers the question.

## USING THE BOOK

Ask a student to read the word story in the pupil display. Discuss with students that some information which adds interest and places the problem in some kind of context is not essential to the solution of the problem.

Assign the exercises. Be certain that the pupils understand how to write the answers in their workbooks.

## ACTIVITIES

Students might enjoy “camouflaging” existing word problems and exchanging them with classmates. Have them find some simple, 1-step word problems (old arithmetic texts are a good source) and

## “Nothin’ But the Facts...”

Word stories can be restated in your own words!

Brendan is training for the gymnastic competition. His favourite movement is to do 4 backflips in a row. He practised this routine 9 times. How many backflips did he complete altogether?

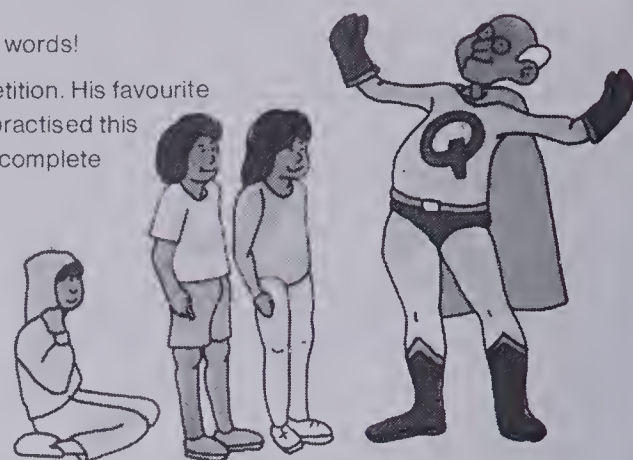
Professor Q restates the story.

4 backflips each time.

9 times.

How many backflips altogether?

$$(4 \times 9 = 36)$$



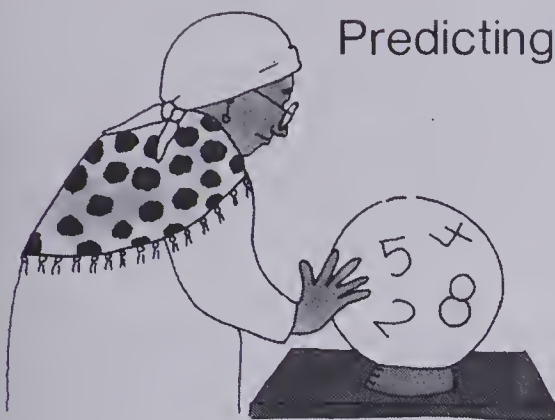
### Exercises

Restate each of these word stories in your own words, then solve.

1. Vicky is training for the city swimming meet. She swam 37 lengths of the pool in the morning and 58 lengths in the afternoon. How many lengths did Vicky complete altogether? **95**
2. Rob and Nels play for the Cougar floor hockey team at Rockwood school. Over the season Rob has scored 19 goals and Nels has scored 31 goals. How many more goals has Nels scored than Rob? **12**
3. Dianne is a member of the Northfield School volleyball team. She practises with her team 3 times every week. How many times would she practise in 14 weeks? **42**
4. John's favourite game is golf. When he looked at his score cards from the summer, he discovered that his highest score was 102 and the lowest was 78. What is the difference between his highest and lowest score? **24**

copy them onto index cards. They should add a descriptive sentence or two to throw solution seekers off the track. Have students exchange or place these in a file for later use.





## Predicting Answers

Often an answer can be predicted without calculating!

Try to predict the answers by using patterns.

$$\begin{aligned}
 1. \quad & 1 \times 1 = 1 \\
 & 11 \times 11 = 121 \\
 & 111 \times 111 = 12321 \\
 & 1111 \times 1111 = 1234321 \\
 & 11111 \times 11111 = 123454321
 \end{aligned}$$

Find the patterns, then predict the answers for each.  
(How might you check your predictions?)

$$\begin{aligned}
 2. \quad & 37037 \times 3 = 111111 \\
 & 37037 \times 6 = 222222 \\
 & 37037 \times 9 = 333333 \\
 & 37037 \times 12 = 444444 \\
 & 37037 \times 15 = 555555 \\
 & 37037 \times 18 = 666666 \\
 & 37037 \times 21 = 777777 \\
 & 37037 \times 24 = 888888 \\
 & 37037 \times 27 = 999999 \\
 3. \quad & 1 \times 9 + 2 = 11 \\
 & 12 \times 9 + 3 = 111 \\
 & 123 \times 9 + 4 = 1111 \\
 & 1234 \times 9 + 5 = 11111 \\
 & 12345 \times 9 + 6 = 111111 \\
 & 123456 \times 9 + 7 = 1111111 \\
 & 1234567 \times 9 + 8 = 11111111 \\
 & 12345678 \times 9 + 9 = 111111111 \\
 4. \quad & 1 \times 91 = 91 \\
 & 2 \times 91 = 182 \\
 & 3 \times 91 = 273 \\
 & 4 \times 91 = 364 \\
 & 5 \times 91 = 455 \\
 & 6 \times 91 = 546 \\
 & 7 \times 91 = 637 \\
 & 8 \times 91 = 728 \\
 & 9 \times 91 = 819
 \end{aligned}$$

$$\begin{aligned}
 5. \quad & 1 \times 8 + 1 = 9 \\
 & 12 \times 8 + 2 = 98 \\
 & 123 \times 8 + 3 = 987 \\
 & 1234 \times 8 + 4 = 9876 \\
 & 12345 \times 8 + 5 = 98765 \\
 & 123456 \times 8 + 6 = 987654 \\
 & 1234567 \times 8 + 7 = 9876543 \\
 & 12345678 \times 8 + 8 = 98765432 \\
 6. \quad & 222222 \times 9 = 1999998 \\
 & 333333 \times 9 = 2999997 \\
 & 444444 \times 9 = 3999996 \\
 & 555555 \times 9 = 4999995 \\
 & 666666 \times 9 = 5999994 \\
 & 777777 \times 9 = 6999993 \\
 & 888888 \times 9 = 7999992 \\
 & 999999 \times 9 = 8999991
 \end{aligned}$$



Predicting answers 97

## OBJECTIVES

To observe number patterns  
To make predictions based on those patterns

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

CALC. W/BK—36.

## USING THE BOOK

The purpose of the lesson is to encourage students to make predictions based on observed patterns. The fact that some multiplication practice may occur is simply an extra benefit. Discuss with students possible strategies for checking their predictions.

Examples

- Check by using a calculator. The constant function is of great help (see page 94).
- If students are working independently and a calculator is not available, a student might check every second or third prediction in the series by multiplying.
- If students are working in small groups, they might agree each to check a different question in the series and then compile the results to check the predictions.

## ACTIVITIES

Ask students to investigate other patterns. One plentiful source of patterns is a hundred chart. Write out the full chart and make multiple copies. Students may discover interesting relationships beyond the three patterns described as follows. Because the enjoyment of these activities is largely based on watching the patterns develop, it is recommended that calculators be used. Alternatively, students could work in groups and share the work of multiplying.

Hundred Chart

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

1. Investigate "X's" on the board by multiplying connecting numbers and find the difference. [The difference will always be 40.]

Try other "X's" of the same size.

$$\begin{aligned}
 & \begin{array}{ccc} (10) & 11 & (12) \\ & \diagdown & \diagup \\ & 20 & 21 & 22 \\ & \diagup & \diagdown \\ (30) & 31 & (32) \end{array} \\
 & 10 \times 32 = 320 \\
 & 360 - 320 = 40 \\
 & 12 \times 30 = 360
 \end{aligned}$$

Try different size "X's". ["X's" of this size will always give a difference of 20.]

$$\begin{aligned}
 & \begin{array}{ccc} (23) & 24 & (25) \\ & \diagdown & \diagup \\ & 33 & 34 & 35 \end{array} \\
 & 23 \times 35 = 805 \\
 & 825 - 805 = 20 \\
 & 33 \times 25 = 825
 \end{aligned}$$

2. Select a number in or near the centre of a row. Multiply as illustrated and find the pattern made by the differences. Repeat for other rows. [Differences will always be 1, 3, 5, and 7.]

$$\begin{array}{cccccccccccc}
 20 & 21 & 22 & 23 & (24) & 25 & 26 & 27 & 28 & 29 \\
 & & & & \diagdown & \diagup & & & & \\
 & & & & 23 & 25 & 27 & & & \\
 & & & & 22 & 24 & 26 & & & \\
 & & & & 21 & 23 & 25 & & & \\
 & & & & 20 & 22 & 24 & & & 
 \end{array}$$

$$\begin{aligned}
 24 \times 24 &= 576 \\
 23 \times 25 &= 575 \\
 22 \times 26 &= 572 \\
 21 \times 27 &= 567 \\
 20 \times 28 &= ?
 \end{aligned}$$

Try the same process using columns rather than rows. What is the pattern? [Differences are 100, 300, 500, and 700.]

3. Try to establish the pattern for "Perplexing Pairs". Start in any row and multiply consecutive pairs of numbers. Find the differences. What pattern develops?

$$\begin{array}{cccccccc}
 20 & 21 & 22 & 23 & 24 & 25 & 26 \\
 \diagdown & \diagup & \diagdown & \diagup & \diagdown & \diagup & \diagdown \\
 & 21 & 22 & 23 & 24 & 25 & 26 \\
 & \diagdown & \diagup & \diagdown & \diagup & \diagdown & \diagup \\
 & & 22 & 23 & 24 & 25 & 26 \\
 & & \diagdown & \diagup & \diagdown & \diagup & \diagdown \\
 & & & 23 & 24 & 25 & 26 \\
 & & & \diagdown & \diagup & \diagdown & \diagup \\
 & & & & 24 & 25 & 26 \\
 & & & & \diagdown & \diagup & \diagdown \\
 & & & & & 25 & 26 \\
 & & & & & \diagdown & \diagup \\
 & & & & & & 26
 \end{array}$$

OBJECTIVE

To evaluate achievement of the chapter objectives

PACING

Level A All  
Level B All  
Level C All

RELATED AIDS

HMS—DM23.

USING THE BOOK

Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a large number of students had difficulty with a particular topic or concept. The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 68).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1	A	70
2, 3	B	71
4	C	73-75
5	D	85, 86, 88
6	E	77-79, 82
7	F	92, 93
8	G	94, 95
9, 10	H	various

Chapter Test

Write the products.

1. (a)  $9 \times 1$  9
- (b)  $18 \times 100$  1800
- (c)  $245 \times 10$  2450
- (d)  $37 \times 1000$  37 000
2. (a)  $8 \times 30$  240
- (b)  $4 \times 900$  3600
- (c)  $5 \times 7000$  35 000
- (d)  $6 \times 800$  4800
3. (a)  $10 \times 70$  700
- (b)  $40 \times 60$  2400
- (c)  $50 \times 300$  15 000
- (d)  $200 \times 400$  80 000

Multiply.

4. (a) 
$$\begin{array}{r} 63 \\ \times 4 \\ \hline 252 \end{array}$$
- (b) 
$$\begin{array}{r} 217 \\ \times 5 \\ \hline 1085 \end{array}$$
- (c) 
$$\begin{array}{r} 4208 \\ \times 3 \\ \hline 12624 \end{array}$$
- (d) 
$$\begin{array}{r} 30195 \\ \times 6 \\ \hline 181170 \end{array}$$
5. (a) 
$$\begin{array}{r} 60 \\ \times 51 \\ \hline 3060 \end{array}$$
- (b) 
$$\begin{array}{r} 82 \\ \times 36 \\ \hline 2952 \end{array}$$
- (c) 
$$\begin{array}{r} 509 \\ \times 43 \\ \hline 21887 \end{array}$$
- (d) 
$$\begin{array}{r} 271 \\ \times 284 \\ \hline 76964 \end{array}$$
6. (a) 
$$\begin{array}{r} 1.6 \\ \times 2 \\ \hline 3.2 \end{array}$$
- (b) 
$$\begin{array}{r} 52.1 \\ \times 4 \\ \hline 208.4 \end{array}$$
- (c) 
$$\begin{array}{r} 129.30 \\ \times 4 \\ \hline 517.20 \end{array}$$
- (d) 
$$\begin{array}{r} 4.127 \\ \times 3 \\ \hline 12.381 \end{array}$$
7. (a) 
$$\begin{array}{r} 6 \\ \times 0.8 \\ \hline 4.8 \end{array}$$
- (b) 
$$\begin{array}{r} 13 \\ \times 0.7 \\ \hline 9.1 \end{array}$$
- (c) 
$$\begin{array}{r} 810 \\ \times 0.6 \\ \hline 486.0 \end{array}$$
- (d) 
$$\begin{array}{r} 5244 \\ \times 0.3 \\ \hline 1573.2 \end{array}$$
8. (a) 
$$\begin{array}{r} 28.1 \\ \times 0.7 \\ \hline 19.67 \end{array}$$
- (b) 
$$\begin{array}{r} 1.729 \\ \times 0.2 \\ \hline 0.3458 \end{array}$$
- (c) 
$$\begin{array}{r} 16.2 \\ \times 0.13 \\ \hline 2.106 \end{array}$$
- (d) 
$$\begin{array}{r} 47.01 \\ \times 0.26 \\ \hline 12.2226 \end{array}$$

Solve.

9. An electronics company in Vancouver received 8 cases from the freighter Orion. Each case contained 75 transistor radios. How many radios were received altogether? 600
10. A motorcycle racetrack is 2.7 km long. How far would a rider travel in 9 laps? 24.3 km

# Cumulative Review

1. Write the meaning of each underlined digit.

- (a) 129 075 5 ones (b) 38.416 (c) 712.49  
2 ten thousands 3 tens 6 thousandths 7 hundreds 4 tenths

2. Round each number to the nearest tenth.

- (a) 453.26 453.3 (b) 12.151 12.2 (c) 8.05 8.1 (d) 62.418 62.4

3. Add.

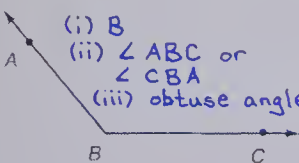
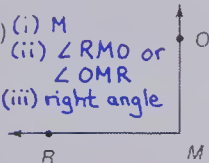
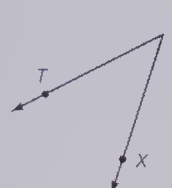
- (a) 
$$\begin{array}{r} 18 \\ 29 \\ +55 \\ \hline 102 \end{array}$$
 (b) 
$$\begin{array}{r} 3.26 \\ +2.95 \\ \hline 6.21 \end{array}$$
 (c) 
$$\begin{array}{r} 71.09 \\ +25.68 \\ \hline 96.77 \end{array}$$
 (d) 
$$\begin{array}{r} 217\ 805 \\ +369\ 529 \\ \hline 587\ 334 \end{array}$$

4. Subtract.

- (a) 
$$\begin{array}{r} 8.02 \\ -4.63 \\ \hline 3.39 \end{array}$$
 (b) 
$$\begin{array}{r} 420.51 \\ -173.26 \\ \hline 247.25 \end{array}$$
 (c) 
$$\begin{array}{r} 68\ 285 \\ -45\ 017 \\ \hline 23\ 268 \end{array}$$
 (d) 
$$\begin{array}{r} 743\ 809 \\ -216\ 470 \\ \hline 527\ 339 \end{array}$$

5. For each of the following:

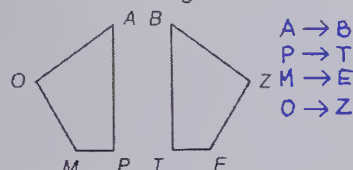
- (i) name the vertex; (ii) name the angle; (iii) name type of angle represented.

- (a)  (i) B  
(ii)  $\angle ABC$  or  $\angle CBA$   
(iii) obtuse angle  
(b)  (i) M  
(ii)  $\angle RMO$  or  $\angle OMR$   
(iii) right angle  
(c)  (i) U  
(ii)  $\angle TUX$  or  $\angle XUT$   
(iii) acute angle

6. Construct a circle with a radius of 3 cm. What is the length of the diameter?

7. This pair of shapes is congruent.

Name the matching vertices.



8. Multiply.

- (a) 
$$\begin{array}{r} 721 \\ \times 6 \\ \hline 4326 \end{array}$$
 (b) 
$$\begin{array}{r} 803 \\ \times 47 \\ \hline 37\ 741 \end{array}$$
  
(c) 
$$\begin{array}{r} 270.6 \\ \times 0.4 \\ \hline 108.24 \end{array}$$
 (d) 
$$\begin{array}{r} 3.419 \\ \times 0.25 \\ \hline 0.854\ 75 \end{array}$$

## OBJECTIVE

To review and test selected concepts and skills previously covered

## PACING

Level A All  
Level B All  
Level C All

## USING THE BOOK

This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a large number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic or refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1	25
2	28
3(a)	7
3(b), 3(c), 4(a), 4(b)	12
3(d), 4(c), 4(d)	21
5	41, 48
6	42
7	54
8(a)	74
8(b)	86
8(c)	94
8(d)	95



# CHAPTER 4 OVERVIEW

This chapter briefly reviews the meaning of division and provides practice with basic division facts. The long and short forms of the division algorithm are reviewed and used to introduce the more efficient standard form of the division algorithm. This form is applied to division involving 1-digit divisors and 1-, 2-, and 3-digit quotients.

Division by powers of 10 is introduced and used to develop the idea that division by 10 and 100 is equivalent to multiplication by 0.1 and 0.01 respectively.

This chapter also develops interrelationships among metric units of measurement. Some new metric units are introduced and there is a review and extension of the topics of temperature, time, and time zones.

## OBJECTIVES

- A To divide by 10, 100, and 1000 with decimal quotients and to multiply by 0.1 and 0.01
- B To divide by 1-digit divisors with 2- and 3-digit quotients
- C To convert among common units of measurement
- D To solve problems using measurement
- E To use a map of time zones of Canada and to solve problems using time units
- F To estimate distance and mass
- G To read a thermometer and to solve problems involving temperature

## BACKGROUND

The ability to divide in an efficient manner depends on a student's ability to understand and use effectively the skills necessary for the standard division algorithm.

These skills include:

1. the ability to follow the mechanical procedures required for the algorithm;
2. a solid understanding of place value;
3. an understanding of the estimation process;
4. multiplication;
5. subtraction.

Most students would benefit from an on-going drill program which includes a review of basic facts, place value, rounding, and estimation.

## MATERIALS

counters  
grid paper (1 cm)  
mini-calculators (optional)  
metre sticks  
metre tapes  
rulers  
trundle wheel  
litre containers  
other containers for liquids  
scales  
balances  
mass sets  
map of Canada suitable for demonstration

## CAREER AWARENESS

### Fishing Guide [118]

A fishing guide's work is mostly seasonal, depending not only on the geographic-climatic area but also on the season regulations which govern the various fish species. For this reason, many fishing guides hold down different jobs during the off season to help them get through the year.

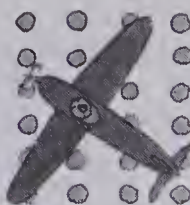
Clients pay money to a guide in return for safe passage to and from a location that is fairly abundant in a specific type of fish. To be successful, then, a fishing guide must be aware of local and regional geography, all aspects of outdoor living and wilderness survival, fishing techniques, and government regulations concerning seasons and catch limits.

A good fishing guide can completely plan all aspects of a fishing trip (provisions, route, campsites, etc.) and locate various species of fish (trout, bass, pickerel, salmon, etc.) given the time of year, time of day, and local geography. A guide is especially sensitive to nature's "warning signs" (i.e., weather, animal habits, plant types, etc.) and is competent in administering first aid under adverse conditions. A fishing guide's expertise is gleaned, not only from books and maps, but also from considerable personal experience.

## Aerial Photographs

Bob is taking aerial photographs of this orchard.

There are 24 trees with 6 rows and 4 columns.



$$24 \div 6$$

This asks, "How many groups of 6 in 24?"

dividend		divisor		quotient
24	-	6	=	4

$$6 \overline{)24}$$



$6 \times 4 = 24$   
Related multiplication fact

$$24 \div 4$$

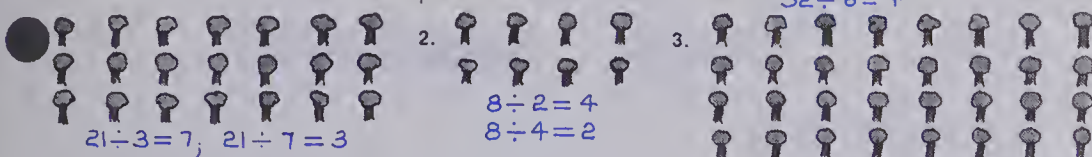
This asks, "How many groups of 4 in 24?"

dividend		divisor		quotient
24	-	4	=	6

$$4 \overline{)24}$$

### Exercises

Write 2 division sentences for each pattern.



Draw patterns to show each division. Write a second division to match.

4.  $18 \div 3 = 6$       5.  $2 \overline{)12}$       6.  $25 \div 5 = 5$       7.  $4 \overline{)16}$

$18 \div 6 = 3$        $6 \overline{)12}$        $25 \div 5 = 5$        $4 \overline{)16}$

Write in words what is being asked, then find the quotient.

8.  $30 \div 6 = 5$       9.  $9 \overline{)63} = 7$       10.  $21 \div 7 = 3$       11.  $40 \div 8 = 5$

12.  $2 \overline{)14} = 7$       13.  $7 \overline{)49} = 7$       14.  $72 \div 8 = 9$       15.  $5 \overline{)15} = 3$

Write a division sentence that expresses how many groups of:

16. 7 in 56  $56 \div 7 = 8$       17. 5 in 45  $45 \div 5 = 9$       18. 3 in 30  $30 \div 3 = 10$       19. 4 in 36  $36 \div 4 = 9$

20. 2 in 18  $18 \div 2 = 9$       21. 8 in 24  $24 \div 8 = 3$       22. 7 in 28  $28 \div 7 = 4$       23. 6 in 48  $48 \div 6 = 8$

Meaning of division 101

## OBJECTIVE

To demonstrate the meaning of division

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

aerial photographs, dividend, divisor, quotient

## MATERIALS

counters, grid paper

## RELATED AIDS

BFA COMPLAB II—46.

## BACKGROUND

Division can be thought of, initially, as the process of identifying the number of equivalent sets or groups of a given size contained in a larger set. As students review division, remind them that acquisition of one fact (e.g.,  $12 \div 4 = 3$ ) provides access to a related fact (e.g.,  $12 \div 3 = 4$ ). Note also the inverse relationship that exists between division and multiplication.

## SUGGESTIONS

**Initial Activity** Using counters, provide numerous concrete experiences for students. Through various arrays, develop the three forms that reflect the concept of division.

○○○○○  
○○○○○  
○○○○○

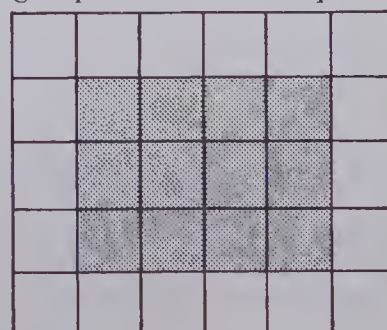
(a) Oral Form: How many groups of 3 in 15?

(b) Number Phrase Form:  $15 \div 3$

(c) Algorithm Form:  $3 \overline{)15}$

Also develop the idea of related division statements (e.g.,  $15 \div 3 = 5$  and  $15 \div 5 = 3$ ), and in turn, relate these to multiplication statements (e.g.,  $5 \times 3 = 15$  and  $3 \times 5 = 15$ ).

Rectangular arrays drawn on grid paper provide an excellent semiconcrete form to highlight these relationships. Note, too, that both counters and grid-paper arrays reinforce the idea that the groups identified are *equivalent*.



$12 \div 3 = 4$   
(three equivalent groups of 4)

## USING THE BOOK

Use the pupil display to reinforce the concepts developed in the Initial Activity.

You may want to alter the instructions for Exercises 8 to 15. Rather than writing statements in words, these exercises could be conducted orally. The rest of the exercises could be assigned for independent work.

## ACTIVITIES

1. Have some students illustrate division sentences (and related multiplication sentences) by using arrays.

*Example*

$18 \div 6 = 3$	$18 \div 6 = 3$
x x x x x x	$18 \div 3 = 6$
x x x x x x	$3 \times 6 = 18$
x x x x x x	$6 \times 3 = 18$

2. Divide the pupils into pairs and provide a spinner numbered from 0-9. The first player uses grid paper to illustrate an array. The second player writes a division fact using the array and scores a number of points equal to the quotient. Players change roles, keeping a cumulative total of their points. At the end of five turns, each player takes a turn twirling the spinner to yield a 2-digit number (or a single if zero is twirled first). The player with the point total closest to this number wins.

3. Play "Concentration" as described in the Activity Reservoir. Use cards such as:

$15 \div 5$	$\longleftrightarrow$	$5 \overline{)15}$	or
$5 \overline{)15}$	$\longleftrightarrow$	$3 \times 5 = 15$	



## OBJECTIVE

To review division facts with 1-digit divisors and 1- and 2-digit quotients

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

BFA COMP LAB II — 48.

## SUGGESTIONS

**Initial Activity** This would be an appropriate time to review basic division facts. One useful method capitalizes on the fact that multiplication is the inverse of division.

*Example*

If I know that  $5 \times 7 = 35$ , then I know that  $35 \div 7 = 5$  and  $35 \div 5 = 7$ .

Prepare multiple copies of this multiplication grid (or have students construct their own). Have students fill in the grid. Remind them that, while there are 100 cells to be completed, half of those cells are made up of related facts. For example, if it is known that  $4 \times 7 = 28$ , then it is known that  $7 \times 4 = 28$ .

$\times$	1	2	3	4	5	6	7	8	9
1									
2									
3									
4	---	---	---	---	---	---	28		
5									
6									
7	---	---	---	28					
8									
9									

This approach not only provides review of multiplication facts, but also clearly demonstrates the relationship between multiplication and division.

Use the completed grid to practise basic division facts. Ask, "How many groups of 7 in 28?" "How many groups of 4 in 28?" Many students will probably refer to the chart initially. As they gain confidence, encourage students to disregard the chart and give the answer through recall.

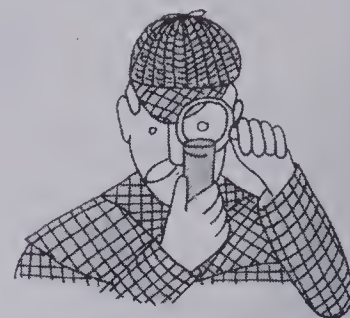
You may want to use this form of oral drill on a regular basis. Short, snappy drill sessions are perhaps more beneficial than long, arduous periods.

## USING THE BOOK

Most students should be familiar with

## Division Riddles

Copy and complete each division exercise. In your workbook, match the letters with each answer. The first one is done for you.



A. What inventions have helped people up in the world?

D 1. $2 \overline{)8}$	N 2. $9 \overline{)27}$	E 3. $4 \overline{)32}$	L 4. $7 \overline{)35}$	A 5. $9 \overline{)9}$
O 6. $5 \overline{)10}$	T 7. $3 \overline{)18}$	C 8. $7 \overline{)0}$	R 9. $5 \overline{)55}$	H 10. $8 \overline{)72}$
K 11. $6 \overline{)42}$	V 12. $3 \overline{)36}$	M 13. $8 \overline{)80}$		

Below the exercises are three rows of letter boxes for matching answers. The first row contains letters T, H, E, A, T, O, R. The second row contains letters A, L, A, R, M. The third row contains letters C, L, O, C, K.

B. What goes through a door, but never goes in or comes out?

L 1. $9 \overline{)63}$	A 2. $5 \overline{)15}$	E 3. $7 \overline{)42}$	H 4. $8 \overline{)64}$
Y 5. $7 \overline{)35}$	K 6. $9 \overline{)81}$	O 7. $6 \overline{)24}$	

Below the exercises are two rows of letter boxes for matching answers. The first row contains letters K, E, Y, H, O, L, E. The second row contains letters 3, 9, 6, 5, 8, 4, 7, 6.

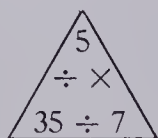
### 102 Basic facts activity

this type of decoding exercise. However, it may be worthwhile to work with students on the first two or three blanks. Remind students that a quotient and its matching letter may occur more than once. For example, Exercise 3 in Section A:  $4 \overline{)32}$ . The quotient 8 (letter E) appears four times in the riddle.

Exercises 8, 9, and 12 in Section A may not have been dealt with in the regular drill period. You may want to provide assistance to students.

## ACTIVITIES

1. Use triangular flashcards to provide drill and extra practice for students.



- Cover the 5 with your hand; question shows  $35 \div 7 = \blacksquare$ .
- Cover the 7 with your hand; question shows  $35 \div 5 = \blacksquare$ .
- Cover the 35 with your hand; question shows  $5 \times 7 = \blacksquare$  or  $7 \times 5 = \blacksquare$ .

2. You may want some students to construct "Division Facts Tables" by

writing consecutive facts and mixed facts on file cards or pieces of Bristol board. The answers could be written on the reverse side.

- |                               |                                |
|-------------------------------|--------------------------------|
| (a) $5 \div 5 = \blacksquare$ | (b) $35 \div 5 = \blacksquare$ |
| $10 \div 5 = \blacksquare$    | $10 \div 5 = \blacksquare$     |
| $15 \div 5 = \blacksquare$    | $25 \div 5 = \blacksquare$     |
| $20 \div 5 = \blacksquare$    | $5 \div 5 = \blacksquare$      |

$50 \div 5 = \blacksquare$

3. Use completed multiplication grids (see the Initial Activity) to play "Division Flip". Two to four players take turns flipping a bottle cap onto the grid and writing related division facts. (A hole punched into the centre of the cap makes it easier to see which number is underneath.) For example, if the bottle cap lands on "48",

write  $8 \overline{)48}$  or  $6 \overline{)48}$ .

Players score a number of points equal to the quotient. (In the previous example, the score is 6 or 8.) The player with the greatest score after seven flips wins. Players will learn which division fact to write.

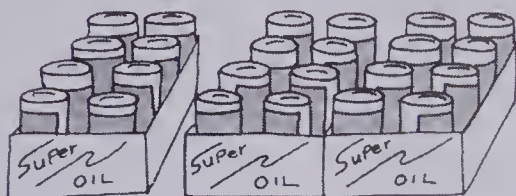


## Service Station Operator

24 cans of "Super Oil"  
8 cans in each case.  
How many cases?

$$24 \div 8 = N$$

This asks, "How many groups?"



24 cans of "Super Oil".  
3 cases.  
How many cans in each case?

$$24 \div 3 = N$$

This asks, "How many things in each group?"

### Exercises

Tell what each problem asks, then solve.

1. 40 cans of wheel grease.  
8 cans in each case. *How many groups?*  
How many cases? *5*
2. 36 bottles of windshield wiper fluid. *How many things in each group?*  
9 cases.  
How many bottles in each case? *4*
3. 56 tubes of lock deicer.  
8 cases. *How many things in each group?*  
How many tubes in each case? *7*
4. 15 cans of radiator cleaner.  
5 cases. *How many things in each group?*  
How many cans in each case? *3*
5. 63 fan belts.  
7 fan belts in each package. *How many groups?*  
How many packages? *9*
6. 48 tins of gas saver.  
6 tins in each case. *How many groups?*  
How many cases? *8*
- ★ 7. 116 cans of transmission fluid. *How many things in each group?*  
4 cases.  
How many cans in each case? *29*
- ★ 8. 84 cans of "Sparkle" car wax.  
6 cans in each case. *How many groups?*  
How many cases? *14*



Problems meaning of division 103

## SUGGESTIONS

**Initial Activity** Provide students with numerous concrete examples of measurement and partitive concepts. It is not intended that students should memorize these terms. It is more important that they begin to distinguish between the two concepts, using their own labels if they wish. This difference can be reinforced by using the questions listed in the display. "How many groups?" (Measurement) "How many things in each group?" (Partitive)

## USING THE BOOK

Exercises 1, 5, 6, and 8 are examples of the measurement concept. Exercises 2, 3, 4, and 7 are examples of the partitive concept.

## ACTIVITIES

A calculator with a constant function can provide an interesting supplement to your division drill program. The constant function allows the operator to enter a series of division phrases without entering the divisor each time.

Also, the machine does not require clearing after each statement.

Try this game, "6 Facts", for two players.

(a) Player 1 enters a division phrase.

$$48 \div 6$$

(b) Player 2 gives the quotient.  
8

(c) Player 1 checks this by entering  $\boxed{=}$  on the machine. The number 8 should appear in the display. (The division sign  $\div$  and the divisor  $\boxed{6}$  no longer need to be entered because of the constant function.)

(d) Player 1 enters another dividend; player 2 gives the quotient; player 1 pushes  $\boxed{=}$  to check the answer. Player 2 receives one point for each correct response.

(e) Play continues for ten sets (facts from  $6 \times 1$  to  $6 \times 10$ ) and then players reverse roles to complete the first round.

(f) The player with the greatest score wins the round. (Note: First of all, the game is much more efficient if Player 1 is provided with a list of dividends appropriate to the game, e.g., 48, 18, 24, 54, 36, 6, 42, etc.

## OBJECTIVES

To solve mini-problems using division  
To develop understanding of the measurement and partitive aspects of division

## PACING

Level A All

Level B All

Level C All

## VOCABULARY

wheel grease, windshield wiper fluid, lock deicer, radiator cleaner, transmission fluid

## MATERIALS

counters

## RELATED AIDS

BFA PROB. SOLVING LAB II — 50.

## BACKGROUND

Division in problem solving involves two concepts frequently called the measurement and partitive concepts of division. Students should begin to develop a firm understanding of these two concepts; otherwise, division can become a meaningless and often difficult manipulation of numbers. In the *measurement concept*, the student is asked to find the number of equivalent sets, or groups of a given size, contained in a larger set. The number of objects in the subset is known.

*Example*

24 pencils altogether. (total number)

6 pencils in each package. (number of objects in each set)

How many packages? (How many sets?)



4 groups of 6.

In the *partitive concept*, the student is asked to find the number of objects in each set. The number of subsets is known.

In most cases, pupils can correctly solve a division problem, that is, find the missing quotient. Difficulties arise when they attempt to correctly interpret the results, calling the answer "pencils" instead of "packages", and vice versa. This difficulty is compounded when remainders occur. The decision has to be made as to whether the remainder is appropriate or not.

Secondly, not all calculators enter the constant as illustrated. It is wise to check the machine yourself before giving it to students.)

## OBJECTIVE

To consolidate understanding of the "long" and "shorter" introductory division algorithms

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

BFA COMP LAB II — 49.  
BFA PROB. SOLVING LAB II — 58.

## BACKGROUND

The two division algorithms presented in the pupil display illustrate the preliminary forms of the standard, or formal, division algorithm. Most students probably will have used these forms (or similar forms) sometime in their school experience.

The Long (or "stacking") Form emphasizes the use of multiples, estimation, and place value. While not listed specifically in the display, the estimation process is fairly evident. Step 1:  $3 \overline{)84} \rightarrow$  How many groups of 3 in 84?

To start, I must select a multiple of ten, but which one?

**Think:**

$3 \times 10 = 30$  (Too few)  
 $(3 \times 20 = 60)$  (Good choice)  
 $3 \times 30 = 90$  (Too many)

From this process, it is clear that 20 is the best estimate.

Step 2: The process is repeated, this time with multiples of one.

How many groups of 3 in 24?

**Think:**

$3 \times 6 = 18$   
 $3 \times 7 = 21$   
 $(3 \times 8 = 24)$

The proper multiple of 3 is 8.

Note that the "stacking" form illustrates the place-value aspect of the quotient in relation to the dividend.

The Short Form is a more concise algorithm. In Step 1, the "2" is placed in the ten's column to represent 2 tens or 20. The "0" (zero) is omitted because of this understanding. In Step 2, the "8" is placed in the one's column.

The estimation process described for the Long Form applies to the Short Form as well.

## SUGGESTIONS

**Initial Activity** Before commencing the lesson, you may want to provide oral or written drill in multiplication for:

(a) basic facts, e.g.,  $6 \times 7$ ,  $4 \times 8$ ,  
 $7 \times 3$ , etc.

## A Visit With Division Forms

Let's review the steps of the long and short forms.

Long Form		$84 \div 3$		Short Form	
		Multiples of 10			
Step 1	$\begin{array}{r} 20 \\ 3 \overline{)84} \\ \underline{60} \\ 24 \end{array}$	Estimate 20. Write 20.	Step 1	$\begin{array}{r} 20 \\ 3 \overline{)84} \\ \underline{60} \\ 24 \end{array}$	Estimate 20. Write 2 in the ten's place.
		Multiples of 1			
Step 2	$\begin{array}{r} 28 \\ 8 \\ 20 \\ 3 \overline{)84} \\ \underline{60} \\ 24 \\ 24 \\ \underline{0} \end{array}$	Estimate 8. Write 8.	Step 2	$\begin{array}{r} 28 \\ 3 \overline{)84} \\ \underline{60} \\ 24 \\ 24 \\ \underline{0} \end{array}$	Estimate 8. Write 8 in the one's place.
Exercises					
Divide.					
1. $4 \overline{)92}$	2. $2 \overline{)72}$	3. $3 \overline{)75}$	4. $5 \overline{)65}$	5. $4 \overline{)68}$	
6. $3 \overline{)96}$	7. $4 \overline{)76}$	8. $6 \overline{)84}$	9. $4 \overline{)60}$	10. $7 \overline{)91}$	
Divide.					
11. $3 \overline{)138}$	12. $7 \overline{)266}$	13. $6 \overline{)258}$	14. $5 \overline{)235}$	15. $4 \overline{)116}$	16. $8 \overline{)208}$
17. $9 \overline{)216}$	18. $3 \overline{)162}$	19. $7 \overline{)441}$	20. $6 \overline{)348}$		

104 Division 1-digit divisor, 2-digit quotient

(b) multiples of ten, e.g.,  $5 \times 30$ ,  
 $9 \times 20$ ,  $6 \times 80$ , etc.

## USING THE BOOK

Use the pupil display to discuss with students the two forms of the algorithm. Emphasize the role of estimation and multiples of ten.

When you assign the exercises, encourage students to use the Short Form since it is a more concise algorithm. Some students may feel more secure using the Long Form. Whichever the case, it is not intended that students become totally proficient with either algorithm. These preliminary forms are introduced here simply to promote some understanding of "how" and "why" division works before attempting the more formal division algorithm.

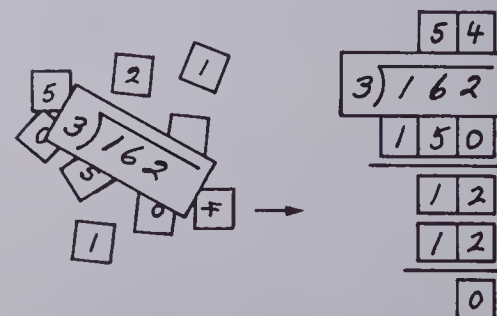
You may want to point out to students that while all exercises require 2-digit quotients, Exercises 11 to 20 require special attention because of the 3-digit dividends. For example, note that in Exercise 11, the "4" (or 40) is placed directly above the "3" in the ten's column, not over the 1 (or 100) in

the hundred's column. This points out the necessity for having a firm understanding of place value.

## ACTIVITIES

1. See "Quad-Row" as described in the Activity Reservoir.

2. Play "Puzzle Race". Provide cards and envelopes. Have the students help write the various digits from appropriate division questions on cards as shown. Keep these in envelopes for continued use. Players simply rearrange the cards, sorting them into their correct position. Use completed exercises from this page and/or pages 332 and 333 as a source.)





## Introducing a New Division Form

Consider  $84 \div 3$ . Terry works with this form.

Step 1

$$\begin{array}{r} \text{Write} \\ 2 \\ 3 \overline{)84} \\ \underline{6} \phantom{0} \\ 24 \end{array}$$

(Terry writes "4" here.)

Think:

$$\begin{array}{r} ? \\ 3 \overline{)8} \end{array}$$

Terry estimates 2.  
( $3 \times 2 = 6$ )

Step 2

$$\begin{array}{r} 28 \\ 3 \overline{)84} \\ \underline{6} \phantom{0} \\ 24 \\ \underline{24} \\ 0 \end{array}$$

$84 - 3 = 28$

### Exercises

Help Terry work through these two examples.

$$\begin{array}{r} 2 \\ 4 \overline{)92} \\ \underline{8} \phantom{0} \\ 12 \end{array}$$

Estimate 2.  
( $4 \times 2 = 8$ )

$$\begin{array}{r} 3 \\ 4 \overline{)92} \\ \underline{8} \phantom{0} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

Estimate  $\blacksquare$  3  
( $4 \times \blacksquare = 12$ )

Divide.

$$\begin{array}{r} 16 \\ 4 \overline{)64} \\ \underline{24} \phantom{0} \end{array}$$

$$\begin{array}{r} 14 \\ 6 \overline{)84} \\ \underline{23} \phantom{0} \end{array}$$

$$\begin{array}{r} 24 \\ 3 \overline{)72} \\ \underline{34} \phantom{0} \end{array}$$

$$\begin{array}{r} 3 \\ 4 \overline{)148} \\ \underline{12} \phantom{0} \\ 28 \end{array}$$

Estimate 3.  
( $4 \times 3 = 12$ )

$$\begin{array}{r} 7 \\ 4 \overline{)148} \\ \underline{12} \phantom{0} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

Estimate  $\blacksquare$  7  
( $4 \times \blacksquare = 28$ )

$$\begin{array}{r} 13 \\ 5 \overline{)65} \\ \underline{35} \phantom{0} \end{array}$$

$$\begin{array}{r} 13 \\ 6 \overline{)78} \\ \underline{13} \phantom{0} \end{array}$$

Division, final form of algorithm, 1-digit divisor, 2-digit quotient 105

## OBJECTIVE

To develop the standard division algorithm using a 1-digit divisor and a 2-digit quotient

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

HMS — DM24.

## BACKGROUND

The standard division algorithm presented in the pupil display features shortcuts which are given legitimacy, in a mathematical sense, through the place-value and estimation concepts dealt with in the preceding lesson (page 104).

The standard algorithm looks at the component parts of the dividend. For example, in Step 1, estimation is made simpler by viewing the initial component as  $3 \overline{)8}$  rather than  $3 \overline{)84}$ .

Notice that the estimate  $3 \overline{)8}$  in the standard algorithm is equivalent to the first step in the Long Form, i.e.,

$$\begin{array}{r} 20 \\ 3 \overline{)84} \end{array}$$
 (That is, the "2" represents "20".) Notice too that while the procedures for multiplication and subtraction (that is, the process used to find the next partial dividend) are simpler, the results are equivalent to those of the Long and Short Forms. For example,

Long Form	Short Form	New Form
$\begin{array}{r} 20 \\ 3 \overline{)84} \\ \underline{60} \phantom{0} \\ 24 \end{array}$	$\begin{array}{r} 2 \\ 3 \overline{)84} \\ \underline{60} \phantom{0} \\ 24 \end{array}$	$\begin{array}{r} 2 \\ 3 \overline{)84} \\ \underline{6} \phantom{0} \\ 24 \end{array}$

The procedures in Step 2 are equivalent as well.

## SUGGESTIONS

**Initial Activity** The method you use to introduce this lesson will depend largely on student background experience in division. Some students may be ready to move directly to the standard algorithm, while others may require a slower transition. Consider using the chalkboard to demonstrate in a parallel manner the development of the standard algorithm from the Long Form algorithm. This approach attempts to promote some understanding of what we are doing and why we are doing it.

As an alternative, you may want to simply demonstrate the procedures used in the New Form, putting emphasis on the place-value aspect of the process as described in the Background.

## USING THE BOOK

Consider demonstrating Exercises 1 and 2 at the chalkboard. For Exercise 1, ask students how they might visualize the

original estimate (e.g.,  $4 \overline{)9}$ ). In Exercise 2, ask students how they might visualize the original estimate (e.g.,  $4 \overline{)14}$ ). Have students explain why the "3" is placed above the "4" rather than the "1".

## ACTIVITIES

1. Those students who have difficulty with the initial estimate might benefit from a "Getting Started" exercise.

*Examples*

Write your estimate, then multiply to check.

(a)  $4 \overline{)7} \longrightarrow 4 \overline{)7}$

$$\begin{array}{r} 1 \\ 4 \overline{)7} \\ \underline{4} \phantom{0} \\ 3 \end{array}$$

2. Ask students to explain what is wrong with estimates like these.

(a)  $4 \overline{)9}$  [Too small] (b)  $3 \overline{)14}$  [Too great]

$$\begin{array}{r} 1 \\ 4 \overline{)9} \\ \underline{4} \phantom{0} \\ 5 \end{array}$$

$$\begin{array}{r} 5 \\ 3 \overline{)14} \\ \underline{15} \phantom{0} \\ ? \end{array}$$

3. See the "Division Race" idea in Activity 2 on page 104 of the teaching notes.



## OBJECTIVE

To introduce the standard division algorithm using a 1-digit divisor and a 3-digit quotient

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

HMS — DM25.  
BFA COMP LAB II — 50.

## BACKGROUND

This lesson extends the use of the “new”, or standard, division algorithm to 3-digit quotients. As described in the Background on page 105, the standard algorithm is much more efficient. Comparison of this algorithm to the Long Form illustrates why it works.

	Long Form Algorithm	Standard Algorithm
Step 1.	$\begin{array}{r} 200 \\ 4 \overline{)952} \\ \underline{800} \\ 152 \end{array}$	$\begin{array}{r} 2 \\ 4 \overline{)952} \\ \underline{8} \\ 15 \end{array}$
Step 2.	$\begin{array}{r} 30 \\ 4 \overline{)952} \\ \underline{800} \\ 152 \\ \underline{120} \\ 32 \end{array}$	$\begin{array}{r} 23 \\ 4 \overline{)952} \\ \underline{8} \\ 15 \\ \underline{12} \\ 32 \end{array}$
Step 3.	$\begin{array}{r} 238 \\ 4 \overline{)952} \\ \underline{800} \\ 152 \\ \underline{120} \\ 32 \\ \underline{32} \\ 0 \end{array}$	$\begin{array}{r} 238 \\ 4 \overline{)952} \\ \underline{8} \\ 15 \\ \underline{12} \\ 32 \\ \underline{32} \\ 0 \end{array}$

## SUGGESTIONS

**Initial Activity** Use the chalkboard and several examples to demonstrate the steps involved in calculating a 3-digit quotient.

## USING THE BOOK

Most students should be able to begin work on the exercises. Others may require further assistance. These students might benefit from a closer inspection of Exercises 1 and 2.

## Extending the New Form

Consider  $952 \div 4$ . Irene works with this example

Step 1

$$\begin{array}{r} 2 \\ 4 \overline{)952} \\ \underline{8} \\ 15 \end{array}$$

Think

?

4  $\overline{)9}$  She estimates 2.  
4  $\times$  2 = 8

Step 2

$$\begin{array}{r} 23 \\ 4 \overline{)952} \\ \underline{8} \\ 15 \\ \underline{12} \\ 32 \end{array}$$

Think:

?

4  $\overline{)15}$  She estimates 3.  
4  $\times$  3 = 12

Step 3

$$\begin{array}{r} 238 \\ 4 \overline{)952} \\ \underline{8} \\ 15 \\ \underline{12} \\ 32 \\ \underline{32} \\ 0 \end{array}$$

Think:

?

4  $\overline{)32}$  She estimates 8  
4  $\times$  8 = 32

$952 \div 4 = 238$

### Exercises

Complete.

$$\begin{array}{r} 12 \blacksquare \\ 7 \overline{)868} \\ \underline{7} \\ 16 \\ \underline{14} \\ 2 \blacksquare \\ \underline{2} \\ 8 \blacksquare \\ \underline{8} \\ 0 \end{array}$$

$$\begin{array}{r} 3 \blacksquare \blacksquare \\ 6 \overline{)1962} \\ \underline{18} \\ 16 \\ \underline{12} \\ 4 \blacksquare \\ \underline{4} \\ 2 \blacksquare \\ \underline{2} \\ 0 \end{array}$$

Divide.

$$\begin{array}{r} 122 \\ 8 \overline{)976} \end{array}$$

$$\begin{array}{r} 123 \\ 7 \overline{)861} \end{array}$$

$$\begin{array}{r} 135 \\ 5 \overline{)675} \end{array}$$

$$\begin{array}{r} 234 \\ 6 \overline{)936} \end{array}$$

$$\begin{array}{r} 117 \\ 7 \overline{)936} \end{array}$$

$$\begin{array}{r} 361 \\ 8 \overline{)722} \end{array}$$

$$\begin{array}{r} 153 \\ 9 \overline{)765} \end{array}$$

$$\begin{array}{r} 237 \\ 10 \overline{)948} \end{array}$$

$$\begin{array}{r} 324 \\ 11 \overline{)6} \end{array}$$

$$\begin{array}{r} 241 \\ 12 \overline{)5} \end{array}$$

$$\begin{array}{r} 237 \\ 13 \overline{)7} \end{array}$$

$$\begin{array}{r} 513 \\ 14 \overline{)2} \end{array}$$

$$\begin{array}{r} 416 \\ 15 \overline{)3} \end{array}$$

$$\begin{array}{r} 234 \\ 16 \overline{)8} \end{array}$$

$$\begin{array}{r} 362 \\ 17 \overline{)4} \end{array}$$

$$\begin{array}{r} 523 \\ 18 \overline{)7} \end{array}$$

106 Division 1-digit divisor 3-digit quotient

## ACTIVITIES

1. Provide oral or written drill for basic multiplication and subtraction facts.

(a)  $3 \times 4$ ,  $5 \times 8$ ,  $6 \times 2$ ,  $7 \times 5$

(b)  $8 - 3$ ,  $9 - 5$ ,  $4 - 1$ ,  $7 - 6$

(c)  $25 - 21$ ,  $18 - 16$ ,  $12 - 7$ ,  $21 - 3$

2. Provide “Getting Started” exercises for those students requiring extra practice with estimates.

$$(a) \begin{array}{r} 17 \\ 4 \overline{) } \end{array}$$

$$(b) \begin{array}{r} 11 \\ 3 \overline{) } \end{array}$$

$$(c) \begin{array}{r} 8 \\ 7 \overline{) } \end{array}$$

$$(d) \begin{array}{r} 23 \\ 5 \overline{) } \end{array}$$

3. See “Quad-Row” in the Activity Reservoir.

## Special Numbers in Division

Investigate the patterns made by:

a 5000 machine.

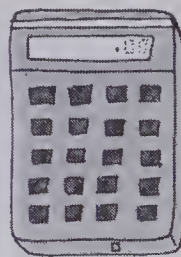
$$\begin{array}{rcl} 5000 & \div & 1 = 5000 \\ 5000 & \div & 10 = 500 \\ 5000 & \div & 100 = 50 \\ 5000 & \div & 1000 = 5 \end{array}$$

What rule helps you divide by 1, 10, 100, 1000?

a 256 machine.

$$\begin{array}{rcl} 256 & \div & 1 = 256 \\ 256 & \div & 10 = 25.6 \\ 256 & \div & 100 = 2.56 \\ 256 & \div & 1000 = 0.256 \end{array}$$

What rule helps you divide by 1, 10, 100, 1000?



### Exercises

Copy and complete the patterns made by these machines.

$$\begin{array}{rcl} 1. \quad 600 & \div & 1 = 600 \\ 600 & \div & 10 = \quad 60 \\ 600 & \div & 100 = \quad 6 \\ 600 & \div & 1000 = 0.6 \end{array}$$

$$\begin{array}{rcl} 2. \quad 100 & \div & 1 = \quad 100 \\ 100 & \div & 10 = \quad 10 \\ 100 & \div & 100 = \quad 1 \\ 100 & \div & 1000 = 0.1 \end{array}$$

$$\begin{array}{rcl} 3. \quad 4581 & \div & 1 = 4581 \\ 4581 & \div & 10 = 458.1 \\ 4581 & \div & 100 = 45.81 \\ 4581 & \div & 1000 = 4.581 \end{array}$$

$$\begin{array}{rcl} 4. \quad 999 & \div & 1 = 999 \\ 999 & \div & 10 = 99.9 \\ 999 & \div & 100 = 9.99 \\ 999 & \div & 1000 = 0.999 \end{array}$$

Divide. Use your rule to help you find each quotient *mentally*.

- |                        |                         |                       |                       |
|------------------------|-------------------------|-----------------------|-----------------------|
| 500 $\div$ 10 = 50     | 45 $\div$ 100 = 0.45    | 200 $\div$ 1 = 200    | 6000 $\div$ 100 = 60  |
| 8000 $\div$ 1000 = 8   | 40 $\div$ 1000 = 0.04   | 1000 $\div$ 10 = 100  | 387 $\div$ 100 = 3.87 |
| 2365 $\div$ 10 = 236.5 | 1000 $\div$ 100 = 10    | 700 $\div$ 1000 = 0.7 | 10 $\div$ 1 = 10      |
| 9000 $\div$ 10 = 900   | 555 $\div$ 1000 = 0.555 | 100 $\div$ 100 = 1    | 400 $\div$ 10 = 40    |

Dividing by 1, 10, 100, 1000 107

## OBJECTIVE

To develop a rule for division by 1, 10, 100, and 1000

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

mini-calculators (optional)

## RELATED AIDS

BFA COMP LAB II — 52.

CALC. W/BK — 38.

## BACKGROUND

A mini-calculator can be a powerful tool for discovering and exploring patterns, for supporting and clarifying a particular hypothesis or conclusion, and for checking mental or mechanical calculations. Some educators see two distinct uses for the calculator.

1. *Pedagogical Use* — The calculator is used as a teaching device, e.g., exploring and extending number patterns.

2. *Functional Use* — The calculator is used strictly as a computing device, e.g., finding the product of  $14 \times 35$ .

Pages 107 to 109 encourage the use of calculators in a pedagogical sense.

## USING THE BOOK

Permit students time to explore the patterns in the pupil display. If they are available, you may wish to use mini-calculators to explore other patterns. Encourage students to develop a general, rather than a particular, rule. **General Rule:** Move the decimal point left the same number of places as there are zeros in the divisor.

(a)  $5000 \div 100 = 50.00$

2 zeros

(b)  $256 \div 10 = 25.6$

1 zero

**Particular Rule:** "Cancel" the same number of zeros in the dividend that there are in the divisor.

$8000 \div 100 = 80$

This rule, however, cannot be applied to all situations.

$256 \div 10 = ?$

The general rule, therefore, is more inclusive.

As they work through Exercises 1 to 4, encourage students to write the quotients under one another using place-value positions.

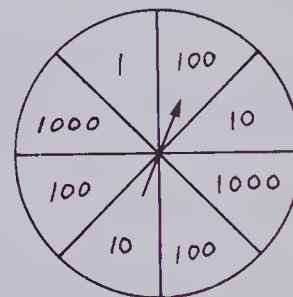
**Example**

Exercise 1  $600$   
 $60$   
 $6$   
 $0.6$

Exercises 5 to 20 are intended to be done mentally. Students need only record the quotients.

## ACTIVITY

You may want to provide extra practice by using the following activity. It can be used with small groups of students or with the whole class.



Construct a spinner as illustrated.

(As an alternative, use a blank die and write the numbers 1, 10, 10, 100, 100, and 1000 on each face.)

(a) Have a student choose any number between 9 and 9999 (e.g., 578).

(b) Spin the spinner (or roll the die). The chosen number is divided by the number indicated on the spinner. Score one point for a correct answer.

(c) Play ten rounds for each game to determine the winner.

## OBJECTIVE

To illustrate the equivalence of dividing by 10 and multiplying by 0.1

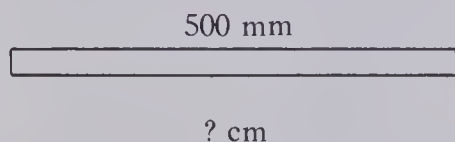
## PACING

Level A All  
Level B All  
Level C All

## SUGGESTIONS

**Initial Activity** The diagram in the pupil display attempts to demonstrate that division by 10 and multiplication by 0.1 give the same result. (If calculators are available, students could evaluate this statement by trying a number of other examples.) You may wish to consider two other models that demonstrate the relationship shown by the balance.

*Measurement Model*



The stick is 500 mm long. Express that distance in centimetres.

(a)  $1 \text{ cm} = 10 \text{ mm}$   
 $\therefore 500 \text{ mm} = 500 \div 10$   
 $= 50 \text{ cm}$

and

(b)  $1 \text{ mm} = \frac{1}{10}$  or  $0.1 \text{ cm}$   
 $\therefore 500 \text{ mm} = 500 \times 0.1$   
 $= 50 \text{ cm}$

*Money Model*

You have 500 one-dollar bills. These are exchanged for ten-dollar bills. How many ten-dollar bills would you have?

(a)  $10 \text{ one-dollar bills} = 1 \text{ ten-dollar bill}$   
 $\therefore 500 \div 10 = 50$

and

(b) a one-dollar bill is  $\frac{1}{10}$  or  $0.1$  of a ten-dollar bill  
 $\therefore 500 \times 0.1 = 50$

## USING THE BOOK

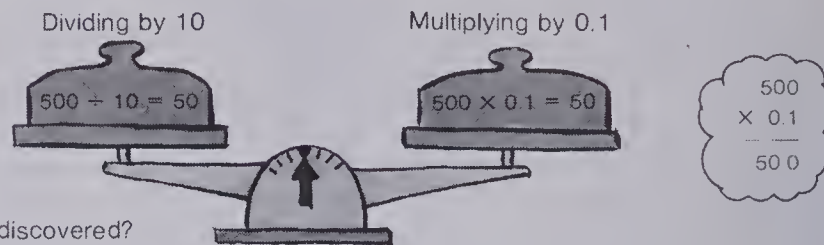
Students have developed a rule for dividing by 10 (page 107) and have had practice at placing the decimal in multiplication. Therefore, all exercises can be done mentally. When the exercises are complete, be sure to bring the relationship between Exercises 2 to 5 and Exercises 6 to 9 to the students' attention.

## ACTIVITIES

1. Play "Concentration" as described in the Activity Reservoir. Use matching sets such as  $200 \div 10$  and  $200 \times 0.1$ ;  $463 \div 10$  and  $463 \times 0.1$ .

## Exploring the World of 10

Kathleen has discovered an interesting fact!  
She drew this diagram.



What has Kathleen discovered?

### Exercises

Using Kathleen's discovery, complete the chart.  
Use a rule to help you work mentally.

1. Numbers	$\div 10$	Equals
5000	$\div 10$	500
250	$\div 10$	25
48	$\div 10$	4.8
9999	$\div 10$	999.9
100	$\div 10$	10
273	$\div 10$	27.3
5	$\div 10$	0.5

Numbers	$\times 0.1$	Equals
5000	$\times 0.1$	500
250	$\times 0.1$	25
48	$\times 0.1$	4.8
9999	$\times 0.1$	999.9
100	$\times 0.1$	10
273	$\times 0.1$	27.3
5	$\times 0.1$	0.5

Divide.

2.  $500 \div 10 = 50$  3.  $614 \div 10 = 61.4$  4.  $1000 \div 10 = 100$  5.  $32 \div 10 = 3.2$

Multiply.

6.  $500 \times 0.1 = 50$  7.  $614 \times 0.1 = 61.4$  8.  $1000 \times 0.1 = 100$  9.  $32 \times 0.1 = 3.2$

Solve.

10.  $241 \div 10 = 24.1$  11.  $16 \times 0.1 = 1.6$  12.  $200 \times 0.1 = 20$  13.  $6 \times 0.1 = 0.6$   
14.  $7000 \times 0.1 = 700$  15.  $41 \div 10 = 4.1$  16.  $10 \times 0.1 = 1$  17.  $527 \div 10 = 52.7$   
18.  $3 \div 10 = 0.3$  19.  $888 \times 0.1 = 88.8$  20.  $620 \div 10 = 62$  21.  $9406 \times 0.1 = 940.6$

108 Division by 10 related to multiplication by 0.1

2. Prepare a matching activity for distribution.

513  $\div 10$  20  $\times 0.1$   
777  $\div 10$  666  $\times 0.1$   
666  $\div 10$  531  $\times 0.1$   
419  $\div 10$  513  $\times 0.1$   
20  $\div 10$  419  $\times 0.1$   
531  $\div 10$  777  $\times 0.1$

Have the pupils prepare their own and exchange with a classmate.



# Exploring the World of 100

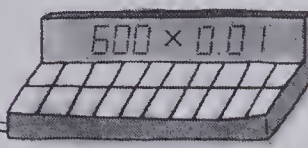
Can you explain what Dr. Morrow's machine shows?



Dividing by 100



Can you make a rule?



Multiplying by 0.01

## Exercises

Complete.

● $4000 \div 100 = ?$ 40	● $5000 \times 0.01 = ?$ 50	● $6735 \div 100 = ?$ 67.35
$400 \div 100 = ?$ 4	$500 \times 0.01 = ?$ 5	$14 \times 0.01 = ?$ 0.14
$40 \div 100 = ?$ 0.4	$50 \times 0.01 = ?$ 0.5	$8 \times 0.01 = ?$ 0.08
$4 \div 100 = ?$ 0.04	$5 \times 0.01 = ?$ 0.05	$250 \div 100 = ?$ 2.5

The following shrubs and trees are measured in centimetres.

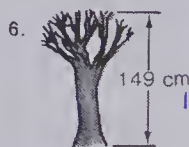
Change each to metres.



4.36 m



0.21 m



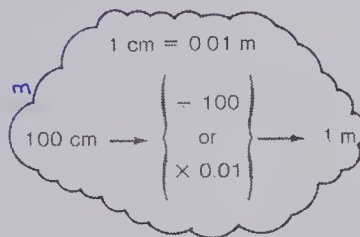
1.49 m



0.1 m



0.83 m



Change the following centimetre measurements to metres.

Use your rule to help you work *mentally*.

9. 268 cm = <input type="text"/> m	10. 580 cm = <input type="text"/> m	11. 1256 cm = <input type="text"/> m	12. 450 cm = <input type="text"/> m
13. 1 cm = <input type="text"/> m	14. 101 cm = <input type="text"/> m	15. 2000 cm = <input type="text"/> m	16. 11 cm = <input type="text"/> m

Division by 100 related to multiplication by 0.01 109

## OBJECTIVE

To illustrate the equivalence of dividing by 100 and multiplying by 0.01

## PACING

Level A All  
Level B All  
Level C All

## SUGGESTIONS

**Initial Activity** From the experiences on page 108, students may deduce quickly that dividing by 100 and multiplying by 0.01 are equivalent. Most pupils will suggest a rule similar to the following: "The decimal point moves 2 places to the left when dividing by 100 or multiplying by 0.01."

## USING THE BOOK

All exercises are meant to be worked mentally. You may need to stress the contents of the cloud (i.e., the relationship between centimetres and metres).

When the exercises are complete, use metre sticks to demonstrate the relationships and to give the answers some concrete sense.

## ACTIVITIES

1. Play "Concentration" as described in the Activity Reservoir. Use matching cards such as  $200 \div 10$  and  $200 \times 0.1$ ;  $419 \div 100$  and  $419 \times 0.01$ .

2. See the "Input-Output" game in the Activity Reservoir. Be sure to use rule strips like the following and appropriate input strips.

$\times 0.01$	$\times 0.01$	$\div 10$
---------------	---------------	-----------

3. Students might enjoy writing their "personal height statements". Have them measure and record their own heights in centimetres and fit it into their "height statement".

\_\_\_\_\_ cm = \_\_\_\_\_ m

Name \_\_\_\_\_

## OBJECTIVE

To change metres to centimetres and centimetres to metres

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

metresticks or metre tapes graduated in centimetres

## SUGGESTIONS

**Initial Activity** If pages 107, 108, and 109 have not been completed just prior to doing page 110, review multiplying and dividing by 100. Include these types:  $4.75 \times 100$ ;  $325 \div 100$ .

## USING THE BOOK

Provide the groups with metresticks or tapes marked in centimetres. Have them do the activities either on mural paper or on the chalkboard. Elicit from them that centimetres are changed to metres by dividing by 100, and metres are changed to centimetres by multiplying by 100.

The pupil display provides a referent for a metre. Also, it serves as a reminder for making the conversions.

Be sure to discuss the relevance of the calculations in red print to the questions asked in Activities 2 and 3 on the page.

Assign the exercises as practice.

## ACTIVITIES

1. Have the students estimate the length and width of the classroom in metres and then change this estimate to centimetres.

2. Have the students estimate the thickness of a book in centimetres. Ask how high a pile of 1000 of the books would be in centimetres, then metres.

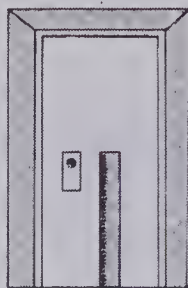
## EXTRA PRACTICE

Change each to centimetres.

1. 7 m    2. 9 m    3. 11 m  
4. 14 m    5. 283 m    6. 2.4 m  
7. 3.4 m    8. 11.4 m    9. 2.35 m  
10. 4.51 m

Change each to metres.

11. 400 cm    12. 700 cm    13. 900 cm  
14. 1500 cm    15. 3500 cm    16. 250 cm  
17. 320 cm    18. 675 cm    19. 1455 cm  
20. 3456 cm



## Centimetres and Metres

1 m = 100 cm  
2 m = 200 cm  
3.5 m = 350 cm

100 cm = 1 m  
200 cm = 2 m  
450 cm = 4.5 m

To change

metres to centimetres  
multiply by 100.

To change

centimetres to metres  
divide by 100.

A doorknob is about 1 m  
or 100 cm from the floor.

Activity (Work in groups.)

1. Draw segments which are 1 m, 2 m, 3 m, and 4 m long.  
Use your centimetre tape to measure each segment in centimetres.  
Copy and complete.

1 m =  $\frac{100}{1}$  cm    2 m =  $\frac{200}{2}$  cm    3 m =  $\frac{300}{3}$  cm    4 m =  $\frac{400}{4}$  cm  
400 cm =  $\frac{4}{100}$  m    300 cm =  $\frac{3}{100}$  m    200 cm =  $\frac{2}{100}$  m    100 cm =  $\frac{1}{100}$  m

2. Draw a segment 50 cm long. How many metres long is it? 0.5 m

$$50 \div 100 = 0.5$$

3. Draw a segment 0.7 m long. How many centimetres long is it? 70 cm

$$0.7 \times 100 = 70$$

Exercises

Change each to centimetres.

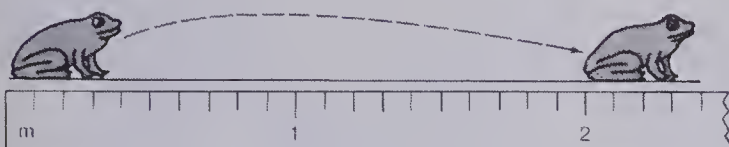
1. 3 m 300 cm    2. 6 m 600 cm    3. 1.6 m 160 cm    4. 3.4 m 340 cm    5. 5.6 m 560 cm

Change each to metres.

6. 200 cm 2 m    7. 800 cm 8 m    8. 150 cm 1.5 m    9. 640 cm 6.4 m    10. 765 cm 7.65 m

## Frog-Jumping Contest

Mark, Sue, and Lee measured the distance Mark's pet frog, Greenback, jumped.



Mark measured in metres.



Sue measured in decimetres.



Lee measured in centimetres.

To change

metres to decimetres  
multiply by 10.

$$2 \text{ m} = 20 \text{ dm}$$

metres to centimetres  
multiply by 100.

$$2 \text{ m} = 200 \text{ cm}$$

To change

decimetres to metres  
divide by 10.

$$20 \text{ dm} = 2 \text{ m}$$

centimetres to metres  
divide by 100.

$$200 \text{ cm} = 2 \text{ m}$$

### Exercises

Change to decimetres.

$$6 \text{ m} = \text{ } \text{dm}$$

$$2. 35 \text{ m} = \text{ } \text{dm}$$

$$3. 26 \text{ m} = \text{ } \text{dm}$$

$$4. 149 \text{ m} = \text{ } \text{dm}$$

Change to centimetres.

$$4 \text{ m} = \text{ } \text{cm}$$

$$6. 67 \text{ m} = \text{ } \text{cm}$$

$$7. 45 \text{ m} = \text{ } \text{cm}$$

$$8. 24 \text{ m} = \text{ } \text{cm}$$

Change to metres.

$$130 \text{ dm} = \text{ } \text{m}$$

$$10. 230 \text{ dm} = \text{ } \text{m}$$

$$11. 5700 \text{ dm} = \text{ } \text{m}$$

$$12. 6800 \text{ dm} = \text{ } \text{m}$$

$$500 \text{ cm} = \text{ } \text{m}$$

$$14. 800 \text{ cm} = \text{ } \text{m}$$

$$15. 700 \text{ cm} = \text{ } \text{m}$$

$$16. 2300 \text{ cm} = \text{ } \text{m}$$

Decimetres 111

## OBJECTIVES

To convert metres to decimetres and centimetres

To convert decimetres and centimetres to metres

## PACING

Level A All

Level B All

Level C All

## MATERIALS

metre sticks or tapes graduated in metres, decimetres, and centimetres

## BACKGROUND

1 m = 10 dm The prefix deci- means one tenth (as in *decimetre* meaning one tenth of a metre).

1 m = 100 cm The prefix centi- means one hundredth (as in *centimetre* meaning one hundredth of a metre).

$$1 \text{ dm} = 10 \text{ cm}$$

## SUGGESTIONS

**Initial Activity** Have students draw segments which are 1 m, 2 m, 3 m, 4 m, 0.4 m, and 0.7 m long. Have them use their tapes graduated in decimetres to measure each. They then copy and complete.

- (a) 1 m =  $\text{ } \text{dm}$  (b) 2 m =  $\text{ } \text{dm}$   
(c) 3 m =  $\text{ } \text{dm}$  (d) 4 m =  $\text{ } \text{dm}$   
(e) 0.4 m =  $\text{ } \text{dm}$  (f) 0.7 m =  $\text{ } \text{dm}$

Have students draw segments 5 dm, 8 dm, 15 dm, 20 dm, 24 dm, and 28 dm. Have them measure the length of each in metres. They then copy and complete.

- (a) 5 dm =  $\text{ } \text{m}$  (b) 8 dm =  $\text{ } \text{m}$   
(c) 15 dm =  $\text{ } \text{m}$  (d) 20 dm =  $\text{ } \text{m}$   
(e) 24 dm =  $\text{ } \text{m}$  (f) 28 dm =  $\text{ } \text{m}$

Elicit from the students how to  
(a) change metres to decimetres, and  
(b) change decimetres to metres.

## USING THE BOOK

The exercises may be done orally with some classes or groups. Frequently ask how to change from one unit to another. You may wish to place the rules shown in the four boxes on the pupil page in a bulletin-board display for future reference.

If the exercises are being completed in workbooks, be sure to clarify what constitutes an acceptable answer, i.e., answers only? Copy and complete?

## ACTIVITIES

1. Have the students estimate the length of various items in the classroom in decimetres. Then have them measure to check their estimations. They then convert each measurement to metres.

2. Repeat Activity 1, but have the estimations given in metres and then converted to decimetres. (Use different items.)

3. Into a game of "Concentration" (as described in the Activity Reservoir) introduce matching sets such as 2 m and 20 dm; 3 m and 300 cm; 400 cm and 40 dm; etc.

## EXTRA PRACTICE

Change each to decimetres.

1. 8 m 2. 22 m  
3. 89 m 4. 113 m

5. 100 m 6. 0.5 m  
\*7. 0.7 m \*8. 0.8 m  
\*9. 1.5 m \*10. 13.6 m  
Change each to metres.  
11. 10 dm 12. 150 dm  
13. 460 dm 14. 789 dm  
15. 1600 dm \*16. 15 dm  
\*17. 12 dm \*18. 25 dm  
\*19. 55 dm \*20. 79 dm

21. Mark's pet frog jumped 3 m.  
Sue's frog jumped 38 dm.  
Whose frog jumped farther?  
How much farther?

22. Lee's frog jumped 190 cm.  
Sue's frog jumped 23 dm.  
Mark's frog jumped 1 m.  
How many centimetres did the three frogs jump altogether?



## OBJECTIVE

To convert metres, decimetres, and centimetres involving decimals

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

metre sticks or tapes graduated in metres, decimetres, and centimetres

## SUGGESTIONS

**Initial Activity** Have students draw segments 1.5 m, 2.3 m, and 3.5 m on the floor or chalkboard. They then measure each in decimetres, then centimetres. Copy and complete.

- (a) 1.5 m = \_\_\_\_ dm  
1.5 m = \_\_\_\_ cm  
(b) 2.3 m = \_\_\_\_ dm  
2.3 m = \_\_\_\_ cm  
(c) 3.5 m = \_\_\_\_ dm  
3.5 m = \_\_\_\_ cm

Discuss with the students that to change a measurement in metres to decimetres, we multiply by 10. Ask the students what we do to change a measurement in decimetres to metres. [Divide by 10.] Repeat for conversion of metres to centimetres and vice versa.

## USING THE BOOK

You may wish to do this page orally, frequently determining from the students how to change from one unit to the other.

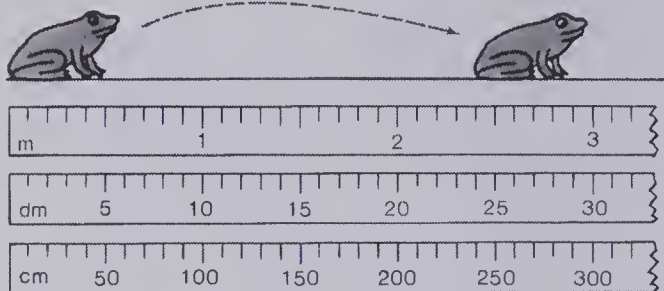
Assign Exercises 17 and 18 as challenges.

## ACTIVITIES

- Organize into groups of three. Students measure and record for each other the following distances in (i) metres, (ii) decimetres, (iii) centimetres.
  - student's height
  - arm span
  - distance each can jump
- See the "Treasure Hunt" game in the Activity Reservoir.
- Some pupils might enjoy using the school library to report to the class on metrication in Canada. Have them touch on such topics as (a) SI and what it means; (b) things we see and hear every day which are metric (i.e., road signs, temperature reports, and so on); (c) units for various common measurements (cm, km, °C, etc.).

## The Championship

Mark measured his frog's jump to the nearest tenth of a metre.

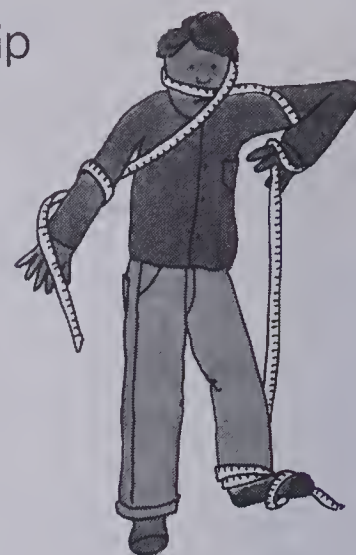


$$2.4 \text{ m} = 24 \text{ dm}$$

$$24 \text{ dm} = 2.4 \text{ m}$$

$$2.4 \text{ m} = 240 \text{ cm}$$

$$240 \text{ cm} = 2.4 \text{ m}$$



### Exercises

Change to decimetres.

1. 4.3 m =  $\frac{43}{10}$  dm

2. 2.7 m =  $\frac{27}{10}$  dm

3. 5.2 m =  $\frac{52}{10}$  dm 4. 0.9 m =  $\frac{9}{10}$  dm

Change to centimetres.

5. 2.7 m =  $\frac{270}{10}$  cm

6. 3.1 m =  $\frac{310}{10}$  cm

7. 5.6 m =  $\frac{560}{10}$  cm 8. 0.8 m =  $\frac{80}{10}$  cm

Change to metres.

9. 45 dm =  $\frac{4.5}{10}$  m

10. 39 dm =  $\frac{3.9}{10}$  m

11. 88 dm =  $\frac{8.8}{10}$  m 12. 7 dm =  $\frac{0.7}{10}$  m

13. 260 cm =  $\frac{2.6}{100}$  m

14. 780 dm =  $\frac{78}{100}$  m

15. 1180 cm =  $\frac{11.8}{100}$  m 16. 30 cm =  $\frac{0.3}{100}$  m

17. Mark's frog jumped 3.6 m.

Sue's frog jumped 27 dm.

How many metres further did Mark's frog jump?  $0.9 \text{ m}$

18. Lee's frog jumped 210 cm.

Mark's frog jumped 0.3 m further.

How many centimetres did Mark's frog jump?  $30 \text{ cm}$

# Kilometres and Hectometres

While at camp Lee and René entered a race.  
The track was 100 m long. The race was 1 km long.  
They ran the track 10 times.

$$1000 \text{ m} = 1 \text{ km}$$

To change

kilometres to metres  
multiply by 1000.

$$1.5 \text{ km} = 1500 \text{ m}$$

- 1 lap = 100 m
- 2 laps = 200 m
- ...
- 9 laps = 900 m
- 10 laps = 1000 m

To change

metres to kilometres  
divide by 1000.

$$2200 \text{ m} = 2.2 \text{ km}$$

$$1 \text{ hm} = 100 \text{ m} \quad (\text{hm means hectometres}) \quad 1 \text{ km} = 10 \text{ hm}$$

## Exercises

- How many metres in a kilometre? **1000**
- How many hectometres in a kilometre? **10**
- The length of a race was 2.5 km.  
How many metres is this? **2500 m**
- Gary runs 3 km every morning.  
How many hectometres is this? **30 hm**

Change to metres.

$$2 \text{ km} = \text{■} \text{ m} \quad \text{2000}$$

$$0.75 \text{ km} = \text{■} \text{ m} \quad \text{750}$$

$$32 \text{ km} = \text{■} \text{ m} \quad \text{32 000}$$

$$0.8 \text{ km} = \text{■} \text{ m} \quad \text{800}$$

$$6.5 \text{ km} = \text{■} \text{ m} \quad \text{6500}$$

$$2.8 \text{ km} = \text{■} \text{ m} \quad \text{2800}$$

Change to kilometres.

$$7000 \text{ m} = \text{■} \text{ km} \quad \text{7}$$

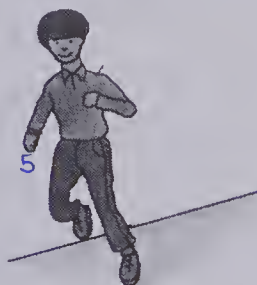
$$250 \text{ m} = \text{■} \text{ km} \quad \text{0.25}$$

$$3750 \text{ m} = \text{■} \text{ km} \quad \text{3.75}$$

$$500 \text{ m} = \text{■} \text{ km} \quad \text{0.5}$$

$$\text{How many laps of a 500 m track are necessary to make 2.5 km? } \text{5}$$

- Which is larger: kilometre or hectometre? **kilometre**  
kilometre or metre? **kilometre**  
hectometre or metre? **hectometre**



Hectometres 113

## OBJECTIVES

- To convert metres to kilometres and kilometres to metres
- To introduce the hectometre as a unit of measurement

## PACING

- Level A All
- Level B All
- Level C All

## VOCABULARY

hectometre

## MATERIALS

tape measures in metres, trundle wheel

## BACKGROUND

Kilo- means 1000. A kilometre is one thousand metres. A metre is one thousandth of a kilometre. A hectometre equals one hundred metres. It is, therefore, one tenth of a kilometre.

## SUGGESTIONS

**Initial Activity** To establish or refresh in the students' minds how long a kilometre is, it is suggested the students should walk, jog, or ride their bicycles for 1 km on a predetermined route marked out in the schoolyard or around several blocks in the neighbourhood. You may wish to time how long it takes the students to walk, jog, or ride this distance.

Have groups of 4 students prepare a cord that is 10 m long. Then they mark off a distance in the playground that is 100 m long. This is a hectometre. How long does it take the students to walk a hectometre? At this rate, how long should it take to walk 1 km? How does this compare with the findings from the 1 km walk mentioned above?

## USING THE BOOK

Discuss the display at the top of the pupil page. Ask if any student has ever swam a kilometre — some with swimming badges will have. The number of lengths in a swimming pool to make a kilometre also reinforces the idea of this distance.

Emphasize the relations among the three units of length discussed on this page.

## ACTIVITIES

- Have the students research such questions as these. Is the distance around the schoolyard more or less than 1 km? Is the distance from a student's house to school more or less than 1 km? 2 km?

- Have students use local maps to prepare a chart of distances between places in kilometres. Extend the chart as desired.

	City A	City B	City C
City A			
City B			
City C			

- The students could plan a round trip of 1000 km. They should draw a map and indicate the kilometres between towns, villages, points of interest, etc.

OBJECTIVES

To review multiplication and division  
To learn the origin of the metre

PACING

- Level A All
- Level B All
- Level C Tune Up — Optional,  
History — All

VOCABULARY

introduced, equator

USING THE BOOK

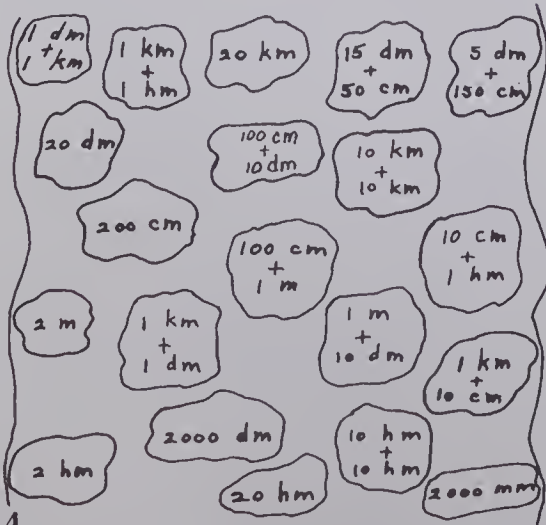
The Tune Up exercises are intended to provide practice in the areas of multiplication and division. The following chart indicates where each topic was handled in the text.

Exercises	Page
1-10	70
11, 12	86
13-15	93
16, 17	105
18-20	106
21-25	107

Develop interest in the history of the metre before assigning the three history exercises. (See *Canada Goes Metric*, Black, Gerald J.; Doubleday Canada Ltd.; Toronto, as an excellent history of measurement.)

ACTIVITIES

1. Ask students to write a report on units of measure used in history.  
(a) cubit (b) inch (c) foot (d) yard  
(e) fathom (f) mile (g) stadia (h) digit
2. Ask students to report on the meaning of each prefix. What is the derivation of each?  
(a) deci (b) centi (c) hecto  
(d) kilo (e) milli
3. Prepare and distribute a "Cross the Stream" puzzle. Each step must be on a rock with the equivalent of 2 m. Have pupils illustrate a way of crossing the stream.



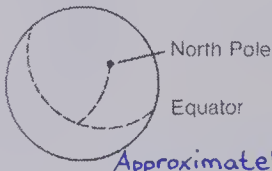
Tune Up

Multiply.

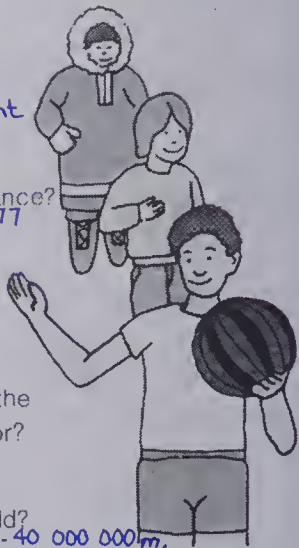
- |                             |                             |                             |                               |                                  |
|-----------------------------|-----------------------------|-----------------------------|-------------------------------|----------------------------------|
| 1. $32 \times 10 = 320$     | 2. $355 \times 10 = 3550$   | 3. $410 \times 100 = 41000$ | 4. $375 \times 100 = 37500$   | 5. $8456 \times 10 = 84560$      |
| 6. $2.2 \times 10 = 22.0$   | 7. $35.2 \times 10 = 352.0$ | 8. $4.65 \times 10 = 46.50$ | 9. $7.31 \times 100 = 731.00$ | 10. $23.41 \times 100 = 2341.00$ |
| 11. $329 \times 38 = 12502$ | 12. $276 \times 43 = 11868$ | 13. $117 \times 0.3 = 35.1$ | 14. $113 \times 0.8 = 90.4$   | 15. $228 \times 0.7 = 159.6$     |
| 16. $7 \overline{)175} 25$  | 17. $8 \overline{)368} 46$  | 18. $6 \overline{)462} 77$  | 19. $8 \overline{)896} 112$   | 20. $9 \overline{)1944} 216$     |
| 21. $320 \div 10 = 32$      | 22. $4600 \div 100 = 46$    | 23. $425 \div 10 = 42.5$    | 24. $65.4 \div 10 = 6.54$     | 25. $72.3 \div 10 = 7.23$        |

History

1. The metric system was first introduced in France in 1793.  
How many years ago is that? *Answer will depend on the current year.*
2. Canada decided to "go metric" in 1970.  
How many years was this after the introduction of the metre in France? *177*
3. How did people agree on how long a metre should be?  
They measured the distance from the North Pole to the Equator.  
Then they divided this distance into 10 000 000 equal parts.  
Each part they called one metre.

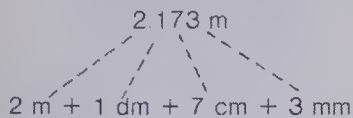


- (a) How many metres from the North Pole to the Equator? *10 000 000 m*
- (b) How many metres in the distance around the world? *Approximately 4 times the distance in (a) -- 40 000 000 m.*





## Using Decimals



$$\begin{aligned} 2 \text{ m} + 1 \text{ dm} + 7 \text{ cm} + 3 \text{ mm} &= 2.173 \text{ m} \\ &= 21.73 \text{ dm} \\ &= 217.3 \text{ cm} \\ &= 2173 \text{ mm} \end{aligned}$$

### Exercises

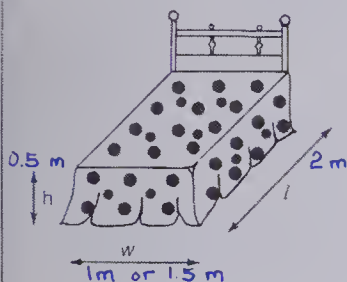
Write as (a) metres (b) decimetres (c) centimetres (d) millimetres.

1. (a) 9.867 m (b) 98.67 dm (c) 986.7 cm (d) 9867 mm  
 2. 8 m + 0 dm + 1 cm + 6 mm (d) 8016 mm  
 3. (a) 7.206 m (b) 72.06 dm (c) 720.6 cm (d) 7206 mm  
 4. 0 m + 0 dm + 1 cm + 5 mm (d) 15 mm  
 5. (a) 0.009 m (b) 0.09 dm (c) 0.9 cm (d) 9 mm  
 6. 0 m + 0 dm + 0 cm + 9 mm (d) 9 mm  
 7. (a) 0.006 m (b) 0.06 dm (c) 0.6 cm (d) 6 mm  
 8. 0 m + 6 dm

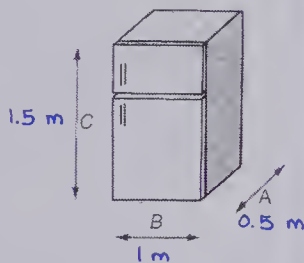
Write as (a) decimetres (b) centimetres (c) millimetres.

9. 2.541 m 10. 1.259 m 11. 4.067 m 12. 6.903 m  
 13. 1.001 m 14. 1.08 m 15. 0.04 m 16. 0.009 m

17. Estimate the dimensions in metres.

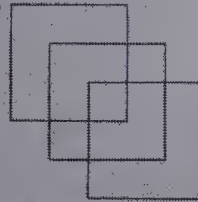


18. Estimate the dimensions in metres.



### BRAINTICKLER

Draw the 3 squares with 1 continuous line without crossing any lines or lifting your pencil.



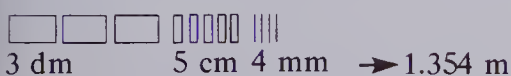
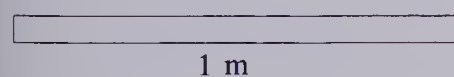
Decimals in measurement 115

### ANSWERS:

9. (a) 25.41 dm (b) 254.1 cm (c) 2541 mm  
 10. (a) 12.59 dm (b) 125.9 cm (c) 1259 mm  
 11. (a) 40.67 dm (b) 406.7 cm (c) 4067 mm  
 12. (a) 69.03 dm (b) 690.3 cm (c) 6903 mm  
 13. (a) 10.01 dm (b) 100.1 cm (c) 1001 mm  
 14. (a) 10.8 dm (b) 108 cm (c) 1080 mm  
 15. (a) 0.4 dm (b) 4 cm (c) 40 mm  
 16. (a) 0.09 dm (b) 0.9 cm (c) 9 mm

## ACTIVITIES

1. Have students measure the length of a line segment that is between 1 m and 2 m. First measure off 1 m, then the number of decimetres, then the number of centimetres, and finally the number of millimetres.



Repeat for other line segments.

2. Have students check their estimates for Exercises 17 and 18 by measuring at home.

## EXTRA PRACTICE

For Level A. Write as metres.

1. 3 m + 8 dm + 5 cm + 7 mm  
 2. 5 m + 0 dm + 3 cm + 1 mm  
 3. 4 m + 2 dm + 0 cm + 2 mm  
 4. 0 m + 3 dm + 9 cm + 8 mm  
 5. 7 m + 3 dm + 2 cm + 0 mm  
 6. 9 m + 2 dm + 0 cm + 1 mm

Write in expanded form.

7. 7.843 m 8. 6.029 m  
 9. 0.354 m 10. 4.643 m  
 11. 9.345 m 12. 8.209 m  
 13. 5.918 m 14. 3.792 m

For Level C. Write each in Exercises 1 to 6 above as indicated.

- (a) in decimetres (b) in millimetres  
 (c) in metres (d) in decimetres  
 (e) in centimetres (f) in millimetres

## OBJECTIVE

To write metric measures in expanded form

## PACING

Level A 1-5, 9-12  
 Level B All  
 Level C All

## RELATED AIDS

HMS — DM26.

## BACKGROUND

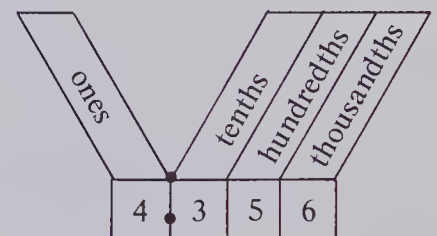
One of the advantages of the metric system of measurement over the Imperial system is that the decimal form of the metre automatically gives the number of decimetres, centimetres, and millimetres. Similarity between this and the place-value chart should be emphasized.

## SUGGESTIONS

**Initial Activity** Review the millimetre.

1000 mm = 1 m  
 100 mm = 1 dm  
 10 mm = 1 cm

Review place value as presented in Chapter 1.



Remind students:

tenths — deci  
 hundredths — centi  
 thousandths — milli

## USING THE BOOK

In discussing the pupil display, emphasize that:

$$\begin{array}{r} 3 \text{ dm} \\ 5 \text{ cm} \\ + 6 \text{ mm} \end{array} \longrightarrow \begin{array}{r} 0.3 \text{ m} \\ 0.05 \text{ m} \\ + 0.006 \text{ m} \end{array}$$

Hence, 3 dm + 5 cm + 6 mm = 0.356 m.

You may have Level A students work only with Exercises 1 to 5 as metres, i.e., 9.867 m; and similarly Exercises 9 to 12 in full expanded form:

$$2.541 \text{ m} = 2 \text{ m} + 5 \text{ dm} + 4 \text{ cm} + 1 \text{ mm}.$$

OBJECTIVE

To calculate perimeter (without formulas) of polygons

PACING

- Level A 1-4
- Level B 1-4
- Level C All

VOCABULARY

perimeter, pedometer

RELATED AIDS

- HMS — DM27.
- BFA PROB. SOLVING LAB II — 121, 125.
- CALC. W/BK — 12.

BACKGROUND

Instruments ending in “-meter” and used for measuring are spelled with “-er”. Measurements are spelled with “-re”.

The formula for the perimeter of a rectangle should be left until later even though some students may recognize the pattern of rectangles as “twice the sum of the length and width” or “the sum of twice the length and twice the width”.

SUGGESTIONS

**Initial Activity** Provide each group of three students with rulers marked appropriately and a large cardboard polygon with sides of units you want the students to use (centimetres or decimetres). Each group is to measure the length of each side and add to find the perimeter. Groups exchange polygons until each group has found the perimeter of each polygon. Students in each group take turns measuring, finding perimeter, and checking.

USING THE BOOK

Discuss the pupil display and indicate that the sum of the measures of the sides of a polygon is the perimeter of the polygon. Show this by adding the distances on each side to get the perimeter.

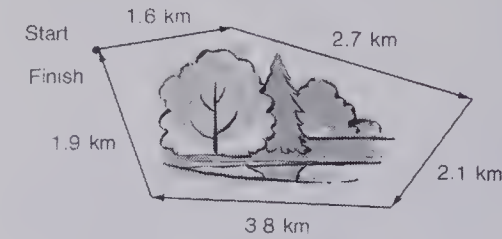
Assign Exercise 1. Check to see that each student does it correctly. Assign the rest of the exercises.

ACTIVITIES

1. Ask students to record the lengths of the sides of the classroom, chalkboard, school, and so on. Then calculate the perimeter of each.
2. Let students use a pedometer to see how far they can walk or run in

Perimeter

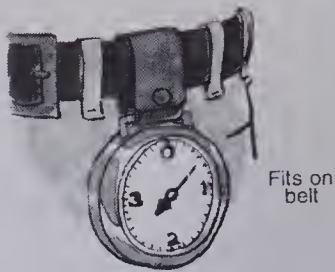
Martin hiked around the park.  
His pedometer showed how far he walked.  
How far did he walk?



He walked 12.1 km.

Perimeter

- 1.6 km
- 2.7 km
- 2.1 km
- 3.8 km
- 1.9 km
- 12.1 km

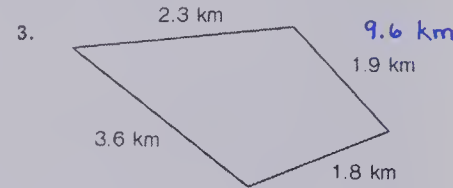
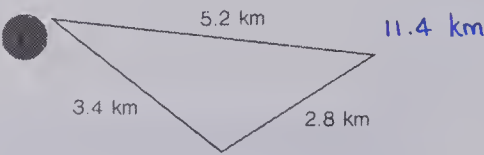


Pedometer  
measures distance  
walked in kilometres.

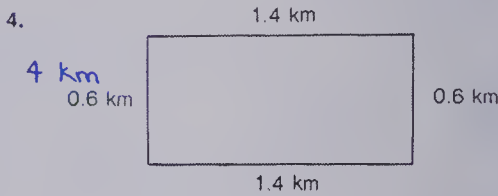
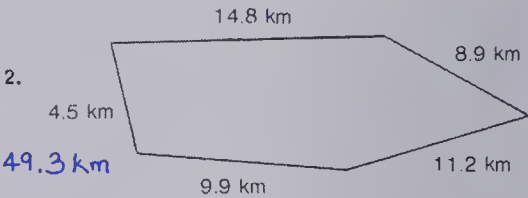
Perimeter is the distance around a shape.

Exercises

Find the perimeter.



- ★ 5. The length of a rectangle is 12.4 km.  
The width is 7.6 km.  
What is the perimeter? 40 km



5 min, 10 min, or 15 min. They can then calculate how far they might go in 1 h. This will lead to the concept of speed developed later.

Using the pedometer, a student can measure the sides of the school block. This lot can then be drawn to scale. Some students can calculate the perimeter from the data provided, while one student can check using the pedometer.

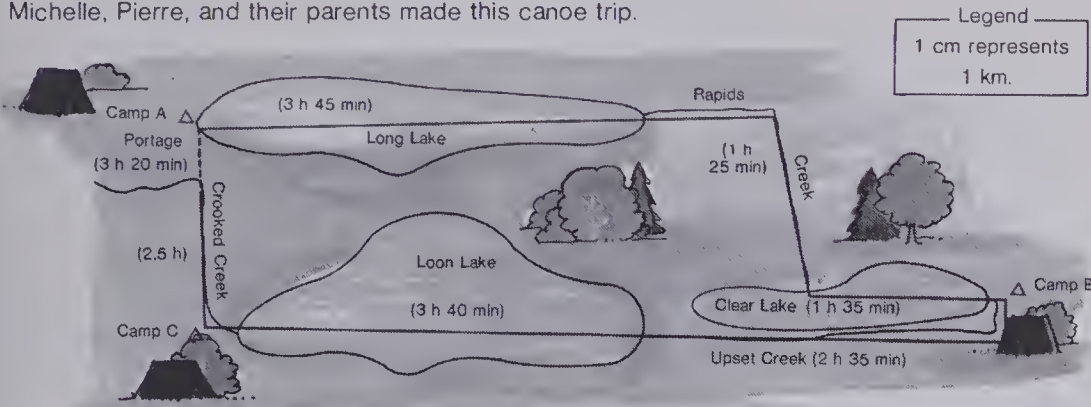
3. Prepare an activity instruction card like this one. Name six shapes in your classroom. Use units which work the best as you write the length of each side. Find the perimeter of each shape.

Shape	Length of Side					Perimeter
	1	2	3	4	5	



# A Canoe Trip

Michelle, Pierre, and their parents made this canoe trip.



## Exercises

- Use the scale measure to find the length in kilometres of:
 

(a) Long Lake	7.3 km	(b) Rapids Creek	5 km
(c) Upset Creek	6.6 km	(d) Loon Lake	6.6 km
(e) Crooked Creek	2.8 km	(f) Portage	1 km
- How long did it take to go from
 

(a) Camp A to Camp B	(b) Camp B to Camp C	(c) Camp C to Camp A?
6 h 45 min	6 h 15 min	5 h 50 min
- Father carried the canoe.  
180 kg of gear is carried by the other three.  
On the average, how much does each of the three carry? 60 kg
- Michelle caught three fish: 1.4 kg, 1.8 kg, 2.8 kg.  
Pierre caught four fish: 1.1 kg, 1.4 kg, 1.2 kg, 1.6 kg.  
Mother caught two fish: 3.6 kg, 1.8 kg.  
Dad didn't catch any.  
Who caught the most fish (in kilograms)? Michelle

Scale drawing 117

## OBJECTIVE

To solve problems involving units of measure

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

portage, loon

## RELATED AIDS

HMS — DM28.

## SUGGESTIONS

**Initial Activity** Introduce the page by discussing how people spend their holidays. Some go to the beach, some visit relatives in cities or on farms, and so on. Some go on canoe trips. Discuss what one would need to know and have before starting on a canoe trip: scale map (review scale drawings), supplies, suitable canoe, compass, etc. Discuss fishing and ways to measure the catch: length and mass. What is a portage?

Review adding hours and minutes as in the following.

*Example*

$$\begin{array}{r} 3 \text{ h } 25 \text{ min} \\ + 1 \text{ h } 50 \text{ min} \\ \hline \end{array}$$

$$4 \text{ h } 75 \text{ min} = 5 \text{ h } 15 \text{ min}$$

## USING THE BOOK

Discuss the map. Ask the students to use a ruler to find the length of Long Lake. Ask what information is provided on the map. Discuss the legend and what it means, why legends on maps are a good idea, and so on.

Assign the problems.

For slower readers, it may be necessary to have individual students take turns reading the questions aloud.

You may need to point out that the question in Exercise 3 asks, "... does each of the *three* carry?" Father is carrying the canoe and, therefore, does not enter into the calculations.

## ACTIVITIES

- A group of students may wish to plan a hypothetical canoe trip or a weekend hike using detailed maps of a local region. Items to be considered are:
  - how far (scale),
  - how many supplies,
  - length of portage (if any),
  - time,
  - safety.

- See "Treasure Hunt" in the Activity Reservoir.

## EXTRA PRACTICE

Change to time with minutes less than 60.

- |               |                |
|---------------|----------------|
| 1. 2 h 70 min | 2. 3 h 90 min  |
| 3. 1 h 80 min | 4. 4 h 100 min |
| 5. 3 h 65 min | 6. 1 h 79 min  |
| 7. 9 h 99 min | 8. 135 min     |

Add.

9.	2 h 35 min	10.	3 h 25 min
	+ 3 h 45 min		+ 4 h 35 min
	<hr/>		<hr/>
	[6 h 20 min]		[8 h 0 min]

11.	6 h 28 min	12.	5 h 37 min
	+ 1 h 44 min		+ 1 h 39 min
	<hr/>		<hr/>
	[8 h 12 min]		[7 h 16 min]



OBJECTIVE

To solve problems involving capacity

PACING

- Level A All
- Level B All
- Level C All

SUGGESTIONS

**Initial Activity** Discuss the work of a fishing or hunting guide (see the Chapter Overview).  
Briefly review what a millilitre and litre are since these will be dealt with in detail on page 119.

USING THE BOOK

You may wish to assign the problems and then work with a group of students that have difficulties with problems. In the small groups, have one pupil read the problem, one restate the problem in his or her own words, another suggest a way to do the question, and finally all calculate the solution. It may be necessary to review Professor Q's steps in problem solving.  
If the exercises are assigned as independent work, read over at least Exercises 1, 2, and 3 to be certain that all pupils are clear on exactly what is being asked.

ACTIVITIES

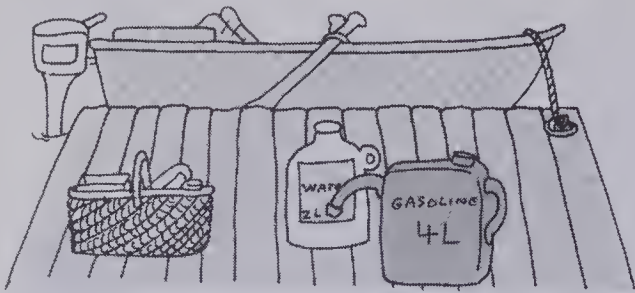
1. Have the students help in the preparation of a deck of cards in order to play "Dominoes" as described in the Activity Reservoir. Use cards such as these.

2000 mL	4000 mL
4 L	three litres
3000 mL	0.5 L
500 mL	3.8 L

2. Play "Bingo" as described in the Activity Reservoir. You may wish to have the players randomly select data for their Bingo grid from a group of numbers displayed on the chalkboard (e.g., 1 L, 2 L, 3 L, ..., 30 L). The caller calls out millilitre amounts while players cross off the corresponding litre amounts.

Fishing Guide

Ian and Henri prepared for a fishing trip.



- They took:
- |                  |                               |
|------------------|-------------------------------|
| 12 L of gasoline | 6 cans of juice (each 150 mL) |
| 300 mL of oil    | lunch                         |
| oars             | 2 L of water                  |
| life jackets     |                               |

Exercises

- 1. Ian needs 12 L of gasoline. Each can holds 4 L. How many cans? **3**
- 2. How many millilitres in each can?  
1 L = 1000 mL  
4 L = **4000** mL
- 3. Henri puts 20 mL of oil in each litre of gasoline. How many millilitres of oil are in each can of gasoline? **80 mL**
- 4. How many millilitres of juice are they taking? **900 mL**  
Are the 6 cans of juice more or less than 1 L? **Less**  
How much more or less? **100 mL less**
- 5. After the boat ride, Henri drove to the garage. The car took 33.2 L of gasoline. He got 10.6 L for the boat. How many litres altogether? **43.8 L**
- 6. Oil is sold in 500 mL cans. Henri bought 4 L of oil. How many cans? **8**
- 7. Ian bailed the rain water out of the boat. Each bail took out 500 mL. He bailed 60 times. How many litres altogether? **30 L**
- 8. The boat motor uses 4 L of gasoline in 1 h. How many litres of gasoline is needed for a 6.5 h trip? **26 L**

# Litres and Millilitres

$$1000 \text{ mL} = 1 \text{ L}$$

Millilitres to litres  
divide by 1000.

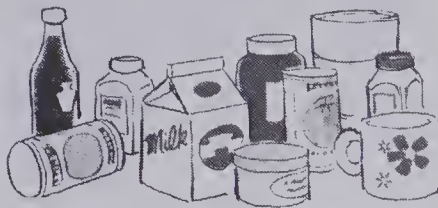
$$3950 \text{ mL} = 3.95 \text{ L}$$

Litres to millilitres  
multiply by 1000.

$$4.68 \text{ L} = 4680 \text{ mL}$$

## Activity

Obtain a variety of cans and containers.  
Estimate the capacity of each. Use appropriate units.  
Check to see how close each estimate is.



## Exercises

Copy and complete.

1.  $1 \text{ mL} = 0.001 \text{ L}$
- 2 mL =  $0.002 \text{ L}$
- 15 mL =  $0.015 \text{ L}$
- 500 mL =  $0.5 \text{ L}$
- 1000 mL =  $1 \text{ L}$

2.  $1 \text{ L} = 1000 \text{ mL}$
- 6 L =  $6000 \text{ mL}$
- 0.5 L =  $500 \text{ mL}$
- 6.5 L =  $6500 \text{ mL}$
- 9.5 L =  $9500 \text{ mL}$

Change to millilitres

3. 3.8 L  $3800 \text{ mL}$

4. 1.75 L  $1750 \text{ mL}$

5. 0.5 L  $500 \text{ mL}$

6. 1.25 L  $1250 \text{ mL}$

Change to litres.

7. 4000 mL  $4 \text{ L}$

8. 1700 mL  $1.7 \text{ L}$

9. 3100 mL  $3.1 \text{ L}$

10. 6000 mL  $6 \text{ L}$

Which is the best buy?

11. 250 mL each  
or 1 L  
\$0.98

12. 500 mL each  
or 2 L each  
\$1.20 each

Litres and millilitres 119

## OBJECTIVES

To convert litres to millilitres and vice versa

To estimate capacity in litres and millilitres

## PACING

Level A All

Level B All

Level C All

## MATERIALS

various liquid containers, litre containers, litre container marked in 100 mL

## SUGGESTIONS

**Initial Activity** Using the litre container marked in 100 mL, have the students fill various containers. Through discussion, elicit the fact that  $1 \text{ L} = 1000 \text{ mL}$  and that to change millilitres to litres, one divides by 1000. To change litres to millilitres, one multiplies by 1000.

Review multiplying and dividing by 1000 and include work with decimals, e.g.,  $3150 \div 1000$  and  $8.65 \times 1000$ .

## USING THE BOOK

After completing the activity, you may wish to do Exercises 1 and 2 orally. After Exercises 3 to 10 are completed by students in their workbooks, discuss the practical Exercises 11 and 12 thoroughly.

## ACTIVITIES

1. Play "Simon Says". The leader makes statements or asks questions of the group. The group only responds when the question or statement is prefaced by "Simon says". For example, the leader may say, "Simon says to change 2 L to millilitres." Response: "2 L is 2000 mL." If the leader says, "How many litres are equivalent to 3000 mL?", there should be no response.

2. See the "Snatch and Match" game listed under "Fraction Cards" in the Activity Reservoir. Have the pupils help prepare matching litre and millilitre cards for the required deck.

3. The cards made for Activity 2 can also be used to play "Snap". Two players, each with half a deck of cards, simultaneously drop a card face up on the desk top. The first one to identify a match wins all cards accumulated on the desk. The object is to win as many cards as possible from the deck during a predetermined period of time.

## EXTRA PRACTICE

Which is the better buy?

1. 200 mL each  
35¢ each  
or 1 L  
\$1.65

2. 500 mL each  
\$1.25 each  
or 1 L  
\$2.60

## OBJECTIVES

To convert kilograms to grams and vice versa

To estimate the mass of various items

## PACING

Level A 1-17, 21, 22, Activity

Level B All

Level C 1-4, 9-12, 17-30, Activity

## MATERIALS

scales or balances with gram and kilo-gram masses, objects of various masses, zip bags filled with gravel to various masses

## SUGGESTIONS

**Initial Activity** Let students experience 500 g, 1 kg, and 5 kg masses. Then ask them to estimate the masses of various objects in the classroom such as the telephone book, softball bat, softball, shoe, etc. Remember to have the students tell whether the unit estimated is in grams, nearest half kilogram, nearest kilogram, etc. Then check each estimate. After labelling each object with its mass, ask questions such as: "What three objects have a mass of about 1 kg?" "What two objects have a mass of about 5 kg?", and so on. Emphasize: kilo  $\longrightarrow$  1000  
1000 g  $\longrightarrow$  1 kg

## USING THE BOOK

You may wish to have students begin these pages with the activity on page 121.

Discuss the display. Ask such questions as:

(a) How many kilograms of meat are there?

(b) What items make about 2 kg?

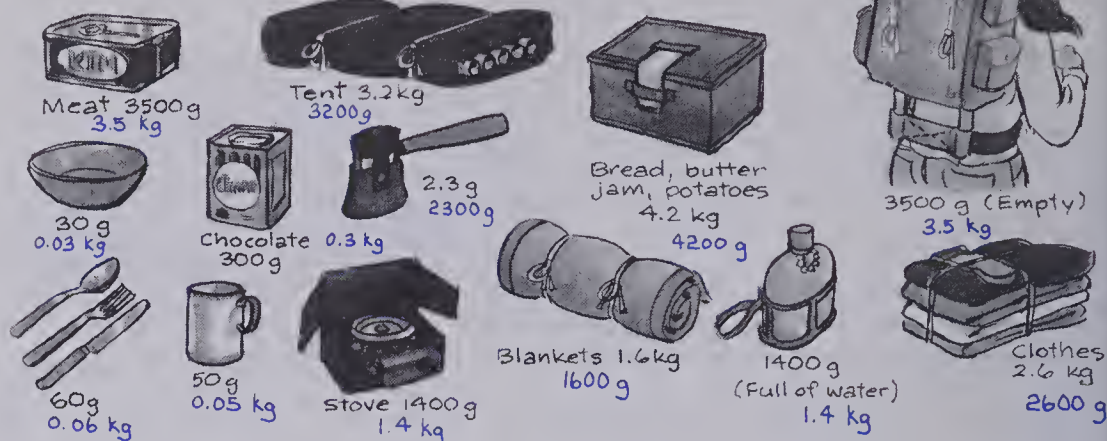
(c) What items make 8 kg?

To do this, the students will need to convert grams to kilograms. For example, 1400 g = 1.4 kg.

Assign the exercises. Do the circled ones orally.

## Kilograms and Grams

Sheila and Carol put these things in their backpacks.



$$1 \text{ kg} = 1000 \text{ g}$$

To change

kilograms to grams  
multiply by 1000.

To change

grams to kilograms  
divide by 1000.

### Exercises

Change to kilograms.

1. 2500 g **2.5 kg** 2. 1500 g **1.5 kg** 3. 250 g **0.25 kg** 4. 500 g **0.5 kg**  
5. 7500 g **7.5 kg** 6. 2350 g **2.35 kg** 7. 600 g **0.6 kg** 8. 800 g **0.8 kg**

Change to grams.

9. 4 kg **4000 g** 10. 1.5 kg **1500 g** 11. 1.2 kg **1200 g** 12. 2.8 kg **2800 g**  
13. 12 kg **12 000 g** 14. 0.5 kg **500 g** 15. 0.75 kg **750 g** 16. 0.1 kg **100 g**

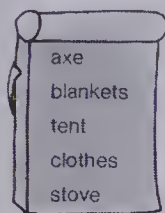
17. Change the mass of each item in the backpacks to (a) grams (b) kilograms. See display.



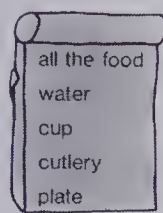
18. Carol is packing the backpacks.  
Which way divides the mass most evenly?

1st. way.

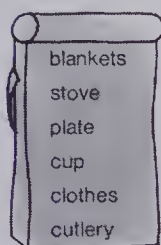
Carol's pack



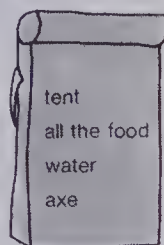
Sheila's pack



Carol's pack



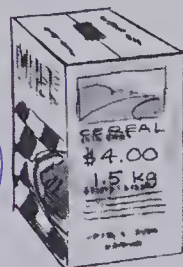
Sheila's pack



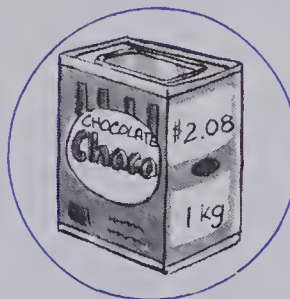
19. What is the mass of all the food, water, and stove in kilograms? **10.8 kg**  
20. What is the mass of all the blankets, tent, and clothes in grams? **7400 g**

Choose the best buy.

21.



22.



Change to grams.

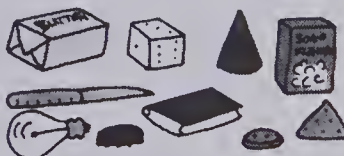
23. 4 kg **4000 g** 24. 11.2 kg **11 200 g** 25. 26.3 kg **26 300 g** 26. 0.3 kg **300 g**

Change to kilograms.

27. 4000 g **4 kg** 28. 8300 g **8.3 kg** 29. 7050 g **7.05 kg** 30. 560 g **0.56 kg**

#### Activity

Collect 10 items. Estimate and check the mass of each item.



Grams and kilograms 121

Subtract.

$$\begin{array}{r} 5. \quad 4 \text{ kg} \quad 125 \text{ g} \\ - 1 \text{ kg} \quad 650 \text{ g} \\ \hline \end{array} \longrightarrow \begin{array}{r} 3 \text{ kg} \quad 1125 \text{ g} \\ - 1 \text{ kg} \quad 650 \text{ g} \\ \hline [2 \text{ kg} \quad 475 \text{ g}] \end{array}$$

$$\begin{array}{r} 6. \quad 5 \text{ kg} \quad 250 \text{ g} \\ - 2 \text{ kg} \quad 780 \text{ g} \\ \hline [2 \text{ kg} \quad 470 \text{ g}] \end{array} \quad \begin{array}{r} 7. \quad 3 \text{ kg} \quad 465 \text{ g} \\ - 1 \text{ kg} \quad 780 \text{ g} \\ \hline [1 \text{ kg} \quad 685 \text{ g}] \end{array}$$

$$\begin{array}{r} 8. \quad 6 \text{ kg} \quad 780 \text{ g} \\ - 1 \text{ kg} \quad 900 \text{ g} \\ \hline [4 \text{ kg} \quad 880 \text{ g}] \end{array} \quad \begin{array}{r} 9. \quad 7 \text{ kg} \quad 430 \text{ g} \\ - 4 \text{ kg} \quad 670 \text{ g} \\ \hline [2 \text{ kg} \quad 760 \text{ g}] \end{array}$$

## ACTIVITIES

1. Ask the students how to change kilograms to grams and grams to kilograms. Provide an exercise such as this.

Fill in the blanks and write a sentence for each.

$$1 \text{ kg} = \boxed{1000} \text{ g} \quad 1 \text{ kg} = \text{---} \text{ g} + \text{---} \text{ g}$$

$$1 \text{ kg} = \boxed{1000} \text{ g}$$

$$1 \text{ kg} = \boxed{1000} \text{ g}$$

$$1 \text{ kg} = \boxed{1000} \text{ g}$$

[Answers may vary but the sum must always be 1000 g.]

2. Develop a fill-in-the-blank chart with exercises like these. Duplicate for the students.

1.	one 5 kg mass	— g
2.	— kg	3000 g
3.	five 2 kg masses	— g
4.	— kg	ten 500 g masses

3. See the "Snatch and Match" and "Snap" ideas listed under "Fraction Cards" in the Activity Reservoir. Use cards that match corresponding gram and kilogram amounts.

$$1.2 \text{ kg} \leftrightarrow 1200 \text{ g}$$

$$0.5 \text{ kg} \leftrightarrow 500 \text{ g}$$

## EXTRA PRACTICE

*Extension.* You may wish to have students calculate these types of exercises and to rename as indicated. This will emphasize the interrelationship. Normally, they would be done using decimals.

Add.

$$\begin{array}{r} 1. \quad 4 \text{ kg} \quad 825 \text{ g} \\ + 2 \text{ kg} \quad 650 \text{ g} \\ \hline [6 \text{ kg} \quad 1475 \text{ g}] \\ = 7 \text{ kg} \quad 475 \text{ g} \end{array}$$

$$\begin{array}{r} 2. \quad 3 \text{ kg} \quad 660 \text{ g} \\ + 1 \text{ kg} \quad 590 \text{ g} \\ \hline [5 \text{ kg} \quad 250 \text{ g}] \end{array}$$

$$\begin{array}{r} 3. \quad 5 \text{ kg} \quad 790 \text{ g} \\ + 1 \text{ kg} \quad 809 \text{ g} \\ \hline [7 \text{ kg} \quad 599 \text{ g}] \end{array}$$

$$\begin{array}{r} 4. \quad 2 \text{ kg} \quad 785 \text{ g} \\ + 1 \text{ kg} \quad 160 \text{ g} \\ \hline [3 \text{ kg} \quad 945 \text{ g}] \end{array}$$

## OBJECTIVES

To use tonne as a measurement of mass  
To convert tonnes to kilograms and  
vice versa

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

tonne

## BACKGROUND

1 t = 1000 kg

## SUGGESTIONS

**Initial Activity** Prepare a set of pictures which illustrate 1 t. They should include single items of 1 t and groups of items that total 1 t. Discuss these with the class emphasizing that a tonne is 1000 kg. By now the students will be getting used to multiplying and dividing by 1000, but if necessary, review this (especially in cases involving decimals). If students can complete these examples, proceed with the exercises.

2000 kg = ■ t      500 kg = ■ t  
■ kg = 3 t      ■ kg = 1.5 t

## USING THE BOOK

Do Exercises 1 to 3 and 8 and 9 orally.  
In Exercise 3 you may wish to talk about the average mass of each person.

Assign Exercises 4 to 7.

## ACTIVITIES

1. Use a weigh scales to determine the total mass of all class members. Calculate this measure in tonnes.

2. Ask the students to prepare a bulletin-board display to illustrate masses of 1 t.

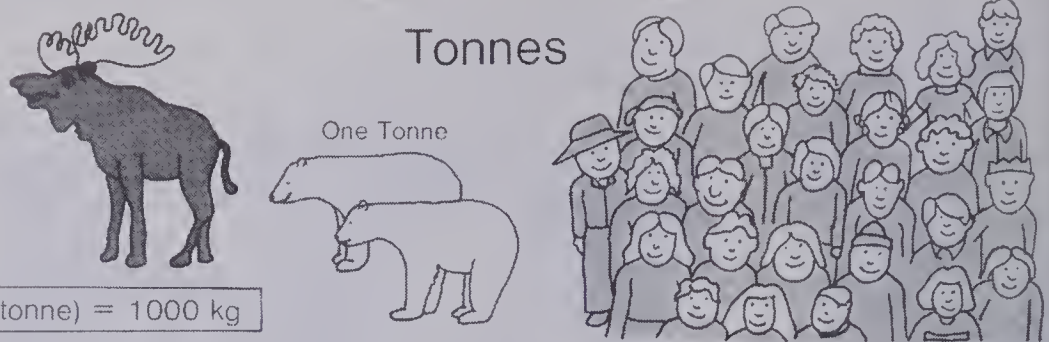
3. Have students research and write a report on the history of units of mass.

## EXTRA PRACTICE

**Extension.** You may wish to have students calculate these and to rename as indicated. This will emphasize the interrelationships. Normally, they would be done using decimals.

Add.

1. $\begin{array}{r} 2 \text{ t } 300 \text{ kg} \\ + 1 \text{ t } 800 \text{ kg} \\ \hline 3 \text{ t } 1100 \text{ kg} \\ 4 \text{ t } 100 \text{ kg} \end{array}$	2. $\begin{array}{r} 4 \text{ t } 800 \text{ kg} \\ + 1 \text{ t } 600 \text{ kg} \\ \hline 6 \text{ t } 400 \text{ kg} \end{array}$
--	--



# Tonnes

One Tonne

1 t (tonne) = 1000 kg

### Exercises

- A large moose is about 1 t. How many kilograms is this? 1000 kg
- Two bears have a mass of about 1 t. About how many kilograms is each bear? 500 kg
- Twenty-eight students together have a mass of about 1 t.  
About how many kilograms is each person (to nearest whole number)? 36 kg

Change to tonnes.

4. $1\ 000\ \text{kg} = \blacksquare\ \text{t}$ <span style="float: right;">1</span>	5. $1000\ \text{kg} = \blacksquare\ \text{t}$ <span style="float: right;">1</span>
$2\ 000\ \text{kg} = \blacksquare\ \text{t}$ <span style="float: right;">2</span>	$1500\ \text{kg} = \blacksquare\ \text{t}$ <span style="float: right;">1.5</span>
$2\ 400\ \text{kg} = \blacksquare\ \text{t}$ <span style="float: right;">2.4</span>	$500\ \text{kg} = \blacksquare\ \text{t}$ <span style="float: right;">0.5</span>
$10\ 000\ \text{kg} = \blacksquare\ \text{t}$ <span style="float: right;">10</span>	$750\ \text{kg} = \blacksquare\ \text{t}$ <span style="float: right;">0.75</span>

Change to kilograms.

6. $1\ \text{t} = \blacksquare\ \text{kg}$ <span style="float: right;">1000</span>	7. $1\ \text{t} = \blacksquare\ \text{kg}$ <span style="float: right;">1000</span>
$2\ \text{t} = \blacksquare\ \text{kg}$ <span style="float: right;">2000</span>	$1.5\ \text{t} = \blacksquare\ \text{kg}$ <span style="float: right;">1500</span>
$18\ \text{t} = \blacksquare\ \text{kg}$ <span style="float: right;">18\ 000</span>	$0.5\ \text{t} = \blacksquare\ \text{kg}$ <span style="float: right;">500</span>
$2.5\ \text{t} = \blacksquare\ \text{kg}$ <span style="float: right;">2500</span>	$0.25\ \text{t} = \blacksquare\ \text{kg}$ <span style="float: right;">250</span>

- What is the approximate mass of a large horse? a large bull? it  
Less than 1t.
- Choose the most reasonable estimate.
 

5 football players (b)	Compact car (a)	Elephant (c)
(a) 1 t	(a) 1 t	(a) 1 t
(b) 500 kg	(b) 500 kg	(b) 500 kg
(c) 5 t	(c) 5 t	(c) 5 t

122 Tonnes

$\begin{array}{r} 3. \ 1 \text{ t } 750 \text{ kg} \\ + 3 \text{ t } 675 \text{ kg} \\ \hline [5 \text{ t } 425 \text{ kg}] \end{array}$	$\begin{array}{r} 4. \ 2 \text{ t } 950 \text{ kg} \\ + 2 \text{ t } 785 \text{ kg} \\ \hline [5 \text{ t } 735 \text{ kg}] \end{array}$
--	--

Subtract.

$\begin{array}{r} 5. \ 4 \text{ t } 150 \text{ kg} \\ - 1 \text{ t } 690 \text{ kg} \\ \hline \end{array}$	$\begin{array}{r} 3 \text{ t } 1150 \text{ kg} \\ - 1 \text{ t } 690 \text{ kg} \\ \hline [2 \text{ t } 460 \text{ kg}] \end{array}$
--	--

$\begin{array}{r} 6. \ 3 \text{ t } 475 \text{ kg} \\ - 2 \text{ t } 760 \text{ kg} \\ \hline [715 \text{ kg}] \end{array}$	$\begin{array}{r} 7. \ 6 \text{ t } 490 \text{ kg} \\ - 2 \text{ t } 790 \text{ kg} \\ \hline [3 \text{ t } 700 \text{ kg}] \end{array}$
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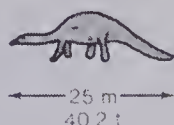
$\begin{array}{r} 8. \ 5 \text{ t} \\ - 2 \text{ t } 650 \text{ kg} \\ \hline [2 \text{ t } 350 \text{ kg}] \end{array}$	$\begin{array}{r} 9. \ 6 \text{ t } 450 \text{ kg} \\ - 3 \text{ t } 670 \text{ kg} \\ \hline [2 \text{ t } 780 \text{ kg}] \end{array}$
--	--



## Dinosaurs



Brachiosaurus  
(arm-lizard)



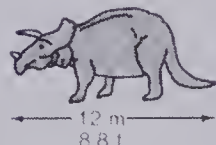
Brontosaurus  
(thunder beast)



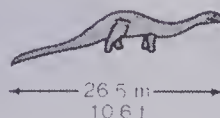
Tyrannosaurus  
(tyrant)



Stegosaurus  
(plated reptile)



Triceratops  
(three-horned face)

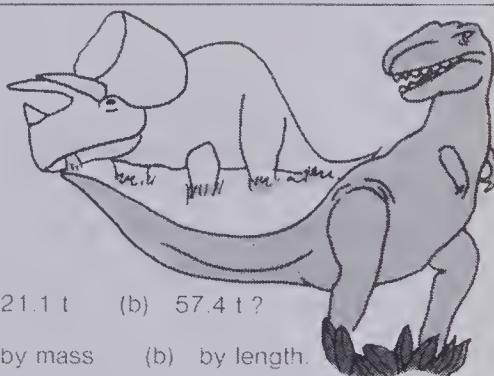


Diplodocus  
(double beak)

### Exercises

What is the difference in mass?

- Brachiosaurus and Stegosaurus **76.8 t**
- Tyrannosaurus and Diplodocus **3.9 t**
- Brontosaurus and Triceratops **31.4 t**
- Which two dinosaurs have a combined mass of  
(a) 19.4 t (b) 41.9 t (c) 118.7 t?
- Which dinosaurs together have a mass of (a) 21.1 t (b) 57.4 t?
- List the dinosaurs from largest to smallest (a) by mass (b) by length.
- Which two dinosaurs differ in length by 12.1 m? **Tyrannosaurus and Diplodocus**
- Was Brachiosaurus more or less than 8 times as heavy as Diplodocus? **Less**
- Which dinosaurs have a combined length of  
(a) 31.5 m (b) 40.9 m (c) 60.5 m?



## OBJECTIVE

To solve problems involving units of length and large masses

## PACING

Level A 1-6  
Level B All  
Level C 4-9

## VOCABULARY

dinosaurs, Brachiosaurus, Brontosaurus, Tyrannosaurus, Stegosaurus, Triceratops, Diplodocus

## BACKGROUND

This page can be done in conjunction with a science class.

## SUGGESTIONS

**Initial Activity** Discuss the Age of Dinosaurs. Use books that describe the feeding habits of the various dinosaurs, the source of the names, and so on.

## USING THE BOOK

Direct the students' attention to Brachiosaurus and Tyrannosaurus. Ask such questions as: "What is their combined mass?" "What is the difference in their lengths?"

Assign the exercises.

Problem Solving — measurement 123

### ANSWERS:

4. (a) Triceratops and Diplodocus (b) Brontosaurus and Stegosaurus  
(c) Brachiosaurus and Brontosaurus 5. (a) Stegosaurus, Triceratops, and Diplodocus (b) Brontosaurus, Tyrannosaurus, Stegosaurus, and Triceratops  
6. (a) Brachiosaurus, Brontosaurus, Diplodocus, Triceratops, Tyrannosaurus, Stegosaurus (b) Diplodocus, Brontosaurus, Brachiosaurus, Tyrannosaurus, Triceratops, Stegosaurus 9. (a) Brachiosaurus and Stegosaurus (b) Tyrannosaurus and Diplodocus (c) Brontosaurus, Stegosaurus, and Diplodocus

## ACTIVITIES

1. Ask the students to prepare a brief report on one or more dinosaurs. For those needing it, suggest aspects that might be reported.

2. In the hall or playground, mark out the actual lengths of the various dinosaurs shown. Then calculate how many compact cars would have the same mass as each; how many elephants; how many people. Students may draw a large picture of one of the dinosaurs and cut from a magazine a picture of the number of people to have the same mass. This can be a bulletin-board display.

## EXTRA PRACTICE

**Extension.** You may wish to have students calculate these to emphasize the interrelationship. Normally, they would be done using decimals.

$$\begin{array}{r} 1. \quad 2 \text{ m} \quad 30 \text{ cm} \\ + 1 \text{ m} \quad 80 \text{ cm} \\ \hline [3 \text{ m} \quad 110 \text{ cm}] \\ = 4 \text{ m} \quad 10 \text{ cm} \end{array}$$

$$\begin{array}{r} 3. \quad 6 \text{ m} \quad 90 \text{ cm} \\ + 1 \text{ m} \quad 55 \text{ cm} \\ \hline [8 \text{ m} \quad 45 \text{ cm}] \end{array}$$

$$\begin{array}{r} 2. \quad 5 \text{ m} \quad 80 \text{ cm} \\ + 2 \text{ m} \quad 65 \text{ cm} \\ \hline [8 \text{ m} \quad 45 \text{ cm}] \end{array}$$

$$\begin{array}{r} 4. \quad 3 \text{ m} \quad 75 \text{ cm} \\ + 2 \text{ m} \quad 95 \text{ cm} \\ \hline [6 \text{ m} \quad 70 \text{ cm}] \end{array}$$

$$\begin{array}{r} 5. \quad 3 \text{ m} \quad 40 \text{ cm} \\ - 1 \text{ m} \quad 80 \text{ cm} \\ \hline [1 \text{ m} \quad 60 \text{ cm}] \end{array}$$

$$\begin{array}{r} 6. \quad 4 \text{ m} \quad 50 \text{ cm} \\ - 2 \text{ m} \quad 80 \text{ cm} \\ \hline [1 \text{ m} \quad 70 \text{ cm}] \end{array}$$

$$\begin{array}{r} 8. \quad 3 \text{ m} \\ - 1 \text{ m} \quad 50 \text{ cm} \\ \hline [1 \text{ m} \quad 50 \text{ cm}] \end{array}$$

$$\begin{array}{r} 7. \quad 5 \text{ m} \quad 10 \text{ cm} \\ - 1 \text{ m} \quad 90 \text{ cm} \\ \hline [3 \text{ m} \quad 20 \text{ cm}] \end{array}$$

$$\begin{array}{r} 9. \quad 6 \text{ m} \quad 60 \text{ cm} \\ - 4 \text{ m} \quad 80 \text{ cm} \\ \hline [1 \text{ m} \quad 80 \text{ cm}] \end{array}$$



## OBJECTIVE

To use degrees Celsius as a measure of temperature

## PACING

Level A All

Level B All

Level C All

## MATERIALS

thermometer

## SUGGESTIONS

**Initial Activity** Use the thermometers to review (a) units of measure for temperature, (b) familiar, common temperatures (i.e., freezing, boiling, room temperature, cold day, hot day, body temperature, etc.). Follow this with a discussion of the effect of temperature on foods and the dangers of eating foods that have not been kept at the proper temperature or have been kept too long.

## USING THE BOOK

Discuss the pupil display by asking such questions as: "What is the lowest temperature of the DANGER ZONE?" "What is the highest temperature of the DANGER ZONE?"

Assign the exercises. During the corrections, emphasize the answer to Exercise 5.

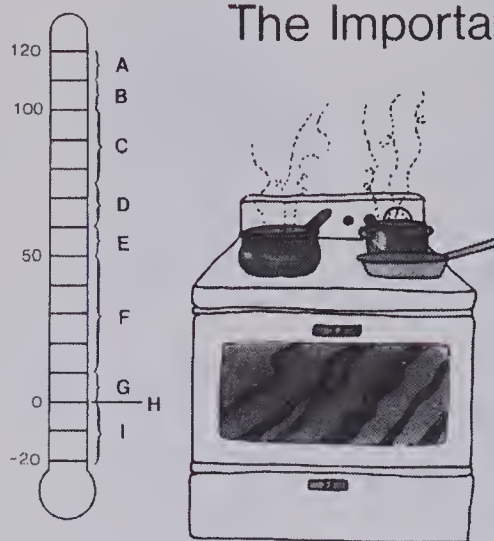
## ACTIVITIES

1. Place a thermometer in ice water in a beaker over a burner. Have students read out and record the temperature at regular intervals of every 2 min. Plot the data in a broken line graph and label.

2. Have students prepare a list of foods that can be kept for reasonable periods of time at room temperature without becoming a danger due to bacteria growth (bread, bananas, potatoes, etc.). Repeat for lists of foods that need to be refrigerated. Repeat for foods that are highly susceptible to bacterial poisoning (i.e., potato salads and stuffed turkey).

3. Some pupils may enjoy using the school or local library to find out and report on what people do about food preservation where there is no refrigeration. The discussion might touch on topics such as (a) eating styles in desert countries and/or more primitive cultures, (b) salted and dried foods, (c) eating habits in this country before refrigeration, (d) the disappearance of milk and bread home delivery, etc.

## The Importance of Temperature



Temperatures colder than  $0^{\circ}\text{C}$  are read as "minus ten" ( $-10$ ).

### Food Temperature

A — Canning temperature short cooking time

B — Canning temperature long cooking time

C — Cooking temperature

D — Warming temperature

E — Warm

F — DANGER ZONE

G — Cool

H — Cold

I — Freezing

### Concern about Bacteria

— destroys most bacteria

— allows survival of bacteria

— some bacteria growth

— rapid growth of bacteria

— Safe zone BUT certain bacteria may grow if food is stored too long

— Stops bacteria growth Bacteria may survive. Foods can spoil if stored too long

### Exercises

- Give the higher and lower temperatures of each category.
  - Canning with short cooking time  $120^{\circ}\text{C}$ ,  $110^{\circ}\text{C}$
  - Cooking temperature  $100^{\circ}\text{C}$ ,  $75^{\circ}\text{C}$
  - DANGER ZONE  $50^{\circ}\text{C}$ ,  $10^{\circ}\text{C}$
  - Freezing  $0^{\circ}\text{C}$ ,  $-20^{\circ}\text{C}$
- How many degrees difference is there between the low temperature of the cooking temperature and the high temperature of the DANGER ZONE?  $25^{\circ}\text{C}$
- How many degrees difference is there between the high temperature of the DANGER ZONE and the low temperature of the cool range?  $50^{\circ}\text{C}$
- Check a refrigerator. What is the temperature at which foods are kept? *About  $2^{\circ}\text{C}$  to  $7^{\circ}\text{C}$ .* Is it in the safe range? *Yes*
- Why should food not be kept too long in a refrigerator? *Bacteria may grow if food is stored too long.*

## Average Temperatures

			Months											
			Jan	Feb.	March	April	May	June	July	Aug	Sept	Oct	Nov.	Dec.
Cities	Halifax	Max	0	-0.5	3.3	8.3	14.4	19.4	23.3	22.7	19.4	13.8	8.3	2.2
		Min	-8.3	-8.8	-4.4	0	5	9.4	13.3	13.8	10.5	6.1	1.1	-5
	Toronto	Max	-0.5	-0.5	3.9	11.1	18.3	23.9	27.2	25.5	21.6	14.4	7.2	1.1
		Min	-7.7	-8.3	-4	3.8	7.7	13.3	18.9	15.6	11.7	5.5	0.6	-5
	Edmonton	Max	-10.5	-6.1	-1	9.3	17.3	21.1	22.9	22.3	17.6	11.8	0	-5.1
		Min	-16.1	-15.8	-9.1	-1.9	5.2	8.9	12.8	10.5	5.1	0	-8.3	-15
	Whitehorse	Max	-13.8	-8.8	-2.2	5	13.8	19.4	19.4	18.3	12.7	5	-5	-11.1
		Min	-22.2	-16.6	-13.3	-5.5	1.1	6.1	7.2	6.1	2.8	-2.2	-11.7	-16.7

### Exercises

- What is the average maximum temperature in Halifax in  
(a) March  $3.3^{\circ}\text{C}$  (b) August  $22.7^{\circ}\text{C}$  (c) December?  $2.2^{\circ}\text{C}$
- What is the average minimum temperature in Whitehorse in  
(a) June  $6.1^{\circ}\text{C}$  (b) September  $2.8^{\circ}\text{C}$  (c) January?  $-22.2^{\circ}\text{C}$
- In what months are the average maximums below freezing (minus readings such as  $-8.3$ ) in Whitehorse? January, February, March, November, and December.
- What is the highest average monthly maximum in Toronto?  $27.2^{\circ}\text{C}$  in Whitehorse?  $19.4^{\circ}\text{C}$  in Edmonton?  $22.9^{\circ}\text{C}$
- What is the lowest average monthly minimum in Whitehorse?  $-22.2^{\circ}\text{C}$  in Halifax?  $-8.8^{\circ}\text{C}$  in Toronto?  $-8.3^{\circ}\text{C}$
- What is the difference in the average monthly maximum and minimum in Toronto in  
(a) June  $10.6^{\circ}\text{C}$  (b) August  $9.9^{\circ}\text{C}$  (c) November  $6.6^{\circ}\text{C}$  (d) January?  $7.2^{\circ}\text{C}$
- What is the difference in the average monthly maximum and minimum in Edmonton in  
(a) May  $12.1^{\circ}\text{C}$  (b) July  $10.1^{\circ}\text{C}$  (c) November  $8.3^{\circ}\text{C}$  (d) December?  $9.9^{\circ}\text{C}$

Using charts — temperature 125

## OBJECTIVE

To read and interpret a temperature chart

## PACING

Level A 1-5  
Level B All  
Level C 3-7

## VOCABULARY

maximum, minimum, average monthly maximum, average monthly minimum

## BACKGROUND

While negative numbers are involved here, the formal operations with integers are not developed. Rather the idea of how far above or below zero is emphasized. This provides the basis for the operations in later grades.

## SUGGESTIONS

**Initial Activity** Bring to class (or make up) a daily temperature list for various cities that are found in most newspapers. Place seven or eight of these on the chalkboard. Demonstrate and ask which city has the highest temperature; lowest temperature; what is the difference in temperature between city D and city F; etc.

## USING THE BOOK

Before assigning the exercises, make certain the students know how to read the chart by asking questions such as "What temperatures does this chart give us?" "For what cities are the temperatures given?" "What is the average maximum temperature in Toronto in April? in Whitehorse in December?"

The starred questions involve negative numbers. They can be done by discussing the "distance" from zero of each reading and working with these. For example, Toronto in March: 3.9 is above zero by 3.9 and  $-4$  is 4 degrees below zero. Therefore, they are 7.9 degrees apart.

You may wish to provide a large wall map of Canada with the four cities labelled to help put things in context.

## ACTIVITIES

- Obtain a chart of average temperatures for your region. Ask similar questions to those in the exercises.
- Ask students to prepare a chart of common temperatures they know.

Water freezes	
Body temperature (normal)	
Hot summer day	
Warm summer day	
Cold summer day	
Cold winter day	
Refrigerator	

- Have students report on the coldest and hottest places on Earth.



OBJECTIVE

To use units of time in problems

PACING

- Level A 1-11
- Level B 1-12
- Level C 1-6, 9-14

VOCABULARY

symbols for second (s), minute (min), hour (h), day (d), year (a): Leap Year

RELATED AIDS

HMS — DM29.

SUGGESTIONS

**Initial Activity** Introduce and/or review with students the various metric symbols for units of time (see Vocabulary). Practise reading various combinations such as:  
(a) 60 min = 1 h — “Sixty minutes equal one hour.”  
(b) 48 h = 2 d — “Forty-eight hours equal two days.”

USING THE BOOK

Review the information in the pupil display. With less able students, do Exercises 1 to 6 orally, making certain each student understands what operation is used each time. Then have the students do the exercises in their notebooks.

ACTIVITIES


1. Ask the students how many hours each spends in a week or a year doing:  
(a) math, (b) sleeping, (c) eating, (d) watching TV, etc. Have the students calculate the money wasted in electricity by leaving a light on when it is not needed if it costs 2¢/h (TV at 7¢/h, classroom lights at 8¢/h). The students will have to determine how many unnecessary hours each is in operation.
2. Practise computational skills by playing “Slalom” as described in the Activity Reservoir.
3. Play “Concentration” as described in the Activity Reservoir. Use matching card sets such as 7 d and 1 week; 180 s and 3 min; 72 h and 3 d; 730 d and 2 a; etc.

EXTRA PRACTICE

1. How many hours in  
(a) 2520 min (b) 2220 min  
(c) 1680 min (d) 3720 min?
2. Chris spends 15 min each day going to school and 15 min coming home again. How much time in minutes does he spend travelling

60 s in 1 min  
60 min in 1 h  
24 h in 1 d

Time



7 d in 1 week  
52 weeks in 1 a (year)  
365 d in 1 a (year)  
(Leap year has 366 d.)

Exercises

Copy and complete.

24 h = ■ min 1440

7 d = ■ h 168

1 week = ■ h 168

1 a = ■ h 8760

1 d = ■ min 1440

1 h = ■ s 3600

3. 192 h = ■ d 8

105 d = ■ weeks 15

1800 s = ■ min 30

4. 1 d = ■ h 24

= ■ min 1440

= ■ s 86 400

5. 1 week = ■ d 7

= ■ h 168

= ■ min 10 080

= ■ s 604 800

6. 1 a = ■ d 365

= ■ h 8760

= ■ min 525 600

= ■ s 31 536 000

7. Alphonse watches TV about 45 min each day.  
How many minutes does he watch TV  
(a) each week? (b) each year? Accept 315 min 16 425 min or 16 380 min.

8. Yvonne watches TV about 840 min each week.  
(a) How many minutes a day is this? 120 min  
(b) How many minutes a year is this? Accept 43 680 min or 43 800 min.

9. Each school day Dina has 15 min recess twice a day.  
How many minutes a week is this? 150 min  
(Careful! How many days in a school week?)

10. Alphonse celebrated his 11th birthday.  
How many days old is he? Accept 4016 d to 4018 d.

11. Yvonne watches about 2 half hour TV programs a day.  
How many hours a year is this? 365 h

12. Marco trains for gymnastics 15 h each day.  
How many hours a year is this? 5475 h

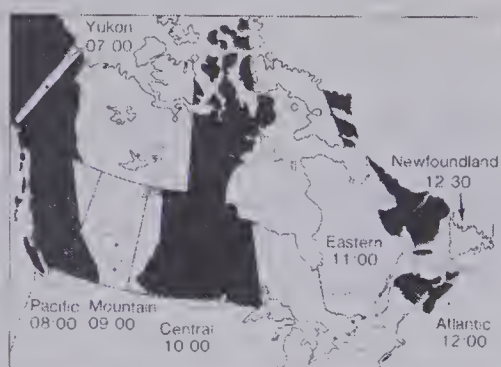
13. Guy trains 2.5 h each day.  
He trains every day  
How many hours a year does Guy train? 912.5 h

14. Guy, a long distance runner, was timed on his first lap.  
He ran a kilometre in 240 s.  
At this rate, how far can he run in 1 h? 15 km

126 Problem solving — time



## Standard Time Zones



When it is 04:00 in Vancouver it is 08:00 in Halifax.

### Exercises

1. When it is 12:00 in Goose Bay, what time is it in  
(a) Regina 10:00 (b) Dawson 07:00 (c) Winnipeg 10:00 (d) Toronto? 11:00
2. When it is 09:00 in Edmonton, what time is it in  
(a) Victoria 08:00 (b) Winnipeg 10:00 (c) Toronto 11:00 (d) St. John's? 12:30
3. When it is 12:30 in St. John's, what time is it in  
(a) Halifax 12:00 (b) Toronto 11:00 (c) Vancouver 08:00 (d) Goose Bay? 12:00
4. How much faster than Atlantic time is Newfoundland time? 30 min
5. Copy this chart which represents the 7 time zones.  
It is 18:00 in the Central Zone.

Name the zones and write the times in each.

	15:00	16:00	17:00	18:00	19:00	20:00	20:30	
West	Yukon	Pacific	Mountain	Central Zone	Eastern	Atlantic	Newfoundland	East

6. Copy this chart of the time zones. Label and show the times.

	15:00	16:00	17:00	18:00	19:00	20:00	20:30	
West	Yukon	Pacific	Mountain	Central Zone	Eastern	Atlantic	Newfoundland	East

Time zones 127

## OBJECTIVE

To use a map of standard time zones of Canada

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

large map of Canada

## BACKGROUND

Canada is divided into seven time zones. The boundaries between time zones are often fixed to accommodate geographic regions or populated areas. For example, a city would not want half its population (area) in one time zone and the other half in another.

Each time zone differs from the adjacent by 1 h — with the exception of the Newfoundland time zone which differs by one half hour.

## SUGGESTIONS

**Initial Activity** You might introduce this page by reviewing twenty-four hour time notation. Give the pupils plenty of opportunity to relate times i.e., 08:00, 11:00, 14:30, 20:00; to identify activities which take place at various times (i.e., "I wake at 07:15." "I go to bed at 21:30." etc.); and to discuss the difference between 01:00 and 13:00, 06:00 and 18:00; etc. Then, with a large wall map of Canada on hand for demonstration purposes, discuss the actual time an event takes place compared to the actual time it is viewed on TV in any given location in the country. For example, a class in Vancouver might discuss the time of a hockey match in Toronto (08:00 Toronto time), but it is viewed live in Vancouver at 05:00 Vancouver time, and vice versa for a baseball game in San Francisco (Pacific time zone) viewed live in Toronto.

Also discuss why it is possible to leave St. John's, Nfld., at 12:30 and arrive in Vancouver at 04:00, but if one leaves Vancouver at 12:30, the flight lands in St. John's at 01:00.

## USING THE BOOK

Do Exercises 1 and 2 orally to make certain students are understanding the procedure. Then assign the balance of the page.

## ACTIVITIES

1. Give the students the current time during the class. Ask them to list at least 5 cities across Canada and give the time in each city.

2. Supply students with a display-sized map of Canada (perhaps the same one from the Initial Activity) and sets of seven consecutively numbered times (e.g., one set including 12:30, 12:00, 11:00, 10:00, 09:00, 08:00, 07:00; another set including 18:30, 18:00,

17:00, ..., 01:00; etc.) marked on small pieces of cardboard. A pupil or group can select a set and sort them into their correct locations on the map. When complete and corrected, have them try a different set.

3. Some students might enjoy preparing a bulletin-board display illustrating time zone differences (e.g., while Atlantic-zone pictures show people eating lunch, Pacific-zone pictures depict breakfast, going to school, etc.).

## OBJECTIVE

To solve problems involving measurement

## PACING

Level A 1-6  
Level B All  
Level C All

## MATERIALS

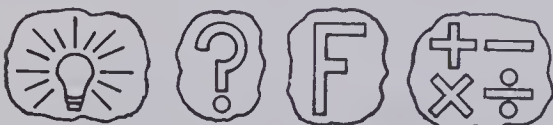
rulers in millimetres

## RELATED AIDS

HMS — DM30.

## USING THE BOOK

Review the steps students should use to solve problems.



You may find it necessary to help students interpret the problems. Reading and discussing each problem before assigning the set is often helpful. You may even ask students to write number sentences on the chalkboard. Some questions may be done in two steps. Discussing the two steps prior to assigning the problem often allows those students who are experiencing difficulties to be successful.

Discuss with students the clues in the problem which indicate the operation to be used in each step. Choosing the correct operation is often the stumbling block.

Remind the class to check their answers for *reasonableness*.

## ACTIVITIES

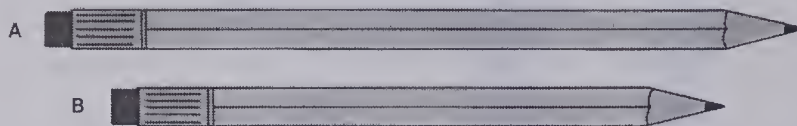
1. Have the students help make up a set of dominoes as described in the Activity Reservoir. Use all units of measurement covered so far.

2. See "Treasure Hunt" as described in the Activity Reservoir.

3. Some pupils might enjoy writing their own measurement word problems. See the notes and ideas listed for solving and writing problems in the Chapter Overview notes for Chapter 1 and on pages 26 and 90-91.

## Solving Problems

1. How many centimetres (to nearest tenth) longer is pencil A than pencil B? **2.4 cm**



2. Each person eats about 49 kg of beef a year.  
How much does a family of 5 eat in a year? **245 kg**
3. It is said that a lifetime is "three score and ten" years.  
A score is 20.  
How long is a lifetime? **70 a**

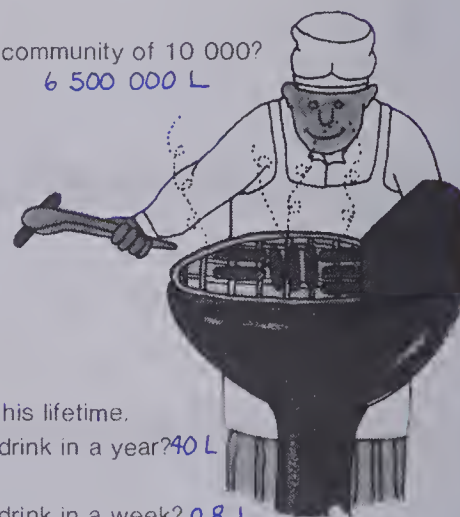
4. A cow provides an average of 12 L of milk per day.  
How many days are required to produce 2800 L? **233.3 d**

5. In a city, the average number of litres of water used per person per day is 650.  
How many litres of water for  
(a) a family of 4 **2600 L** (b) a community of 10 000? **6 500 000 L**

6. There were 20 kg of wieners at a wiener roast.  
Class A ate 5.6 kg of wieners.  
Class B ate 4.8 kg of wieners.  
Class C ate 7.1 kg of wieners.  
How many kilograms of wieners were left over? **2.5 kg**

7. Slot cars are exciting.  
Margo's car made 1 lap in 15 s.  
How many laps in 1 min? **4**

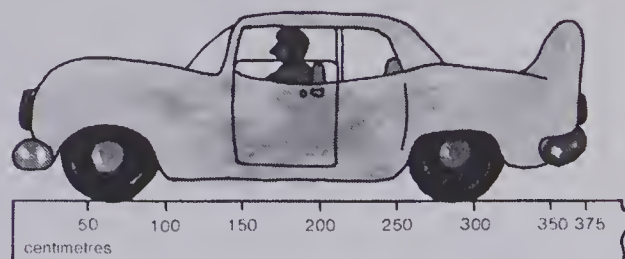
8. The "average" Canadian drinks 2800 L of milk in his lifetime.  
(a) How many litres does the average Canadian drink in a year? **40 L**  
(Use the answer to Exercise 3.)  
(b) How many litres does the average Canadian drink in a week? **0.8 L**





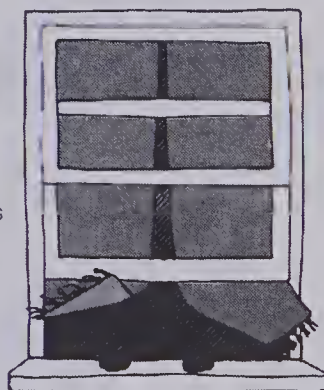
## Estimating

Martin estimated the length of the car.  
He estimated 4 m  
Martin measured the car.  
Length: 375 cm  
3.75 m  
His estimate was reasonable.



### Activity

1. Estimate, then measure the length and width in metres of  
(a) your school (b) the hall outside your classroom.
2. Estimate, then measure the length and width in centimetres of  
(a) a double sheet of newspaper (b) a window in your room.
3. (a) Estimate the length of your teacher's car in (i) centimetres  
(ii) metres.  
(b) Check by measuring in centimetres. Convert to metres.
4. (a) Estimate the length of a bicycle in (i) centimetres  
(ii) metres  
(b) Check by measuring in centimetres. Convert to metres.
5. (a) Estimate the length of the school ground in (i) metres  
(ii) hectometres.  
(b) Check by measuring in metres. Convert to hectometres.
6. (a) Estimate the distance around your school ground in  
(i) metres (ii) hectometres (iii) kilometres.  
(b) Check by measuring in metres.



Estimating 129

## OBJECTIVE

To estimate distances in centimetres, metres, and kilometres

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

metre sticks and tapes, trundle wheel

## RELATED AIDS

HMS—DM31.

## BACKGROUND

Measurements are approximate numbers. When making or estimating measurements, the student should know what unit he or she is to use to measure or estimate—the nearest metre, the nearest tenth of a metre, the nearest centimetre, etc. In measuring, this will require the student to round to the nearest unit.

## SUGGESTIONS

**Initial Activity** Discuss rounding in making measurements by asking students to measure pre-drawn segments on the chalkboard to the nearest centimetre. Use segments which are 13.3 cm, 13.6 cm, 24.2 cm, and 24.8 cm. Then use segments 2.3 m and 2.8 m, and ask them to measure to the nearest metre.

## USING THE BOOK

Students might work in pairs. Each makes and records their estimate. Then they measure and compare the estimates to the actual.

Be certain that students are familiar with an acceptable answer format.

## ACTIVITIES

1. Emphasize the Activity in the student text by having the students make estimates of other lengths and distances which are in, or adjacent to, your school. For example, measure the gymnasium, the playground, the distance from the school to a shopping centre, etc.

2. Play the game "Estimating". Form two teams: A and B. Team A picks an object and says, "We can estimate its mass (or length) better than you. We estimate it is \_\_\_\_ (units).

What is your estimate?" Team B replies. The two teams then check by measuring or consulting reference books. The difference between each estimate and the actual is then calculated and the team with the closest estimate gets a point. Team B then starts over. The game continues until each player on each team has had a turn.

3. Prepare the game "Concentration" as described in the Activity Reservoir. Use all units of measurement discussed so far.



OBJECTIVE

To evaluate achievement of the chapter objectives

PACING

- Level A All
- Level B All
- Level C All

RELATED AIDS

HMS — DM32.

USING THE BOOK

Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a large number of students had difficulty with a particular topic or concept. The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 100). An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1-4, 9-12	A	107-109
5-8	B	104-106
13-22	C	110-113, 115, 119-123
23-28	D	various
24, 27	E	126
28	F	129
26	G	124-125

Chapter Test

Divide.

1.  $6000 \div 100$  60
2.  $486 \div 10$  48.6
3.  $10 \div 1$  10
4.  $567 \div 1000$  0.567
5.  $6 \overline{)72}$  12
6.  $4 \overline{)64}$  16
7.  $3 \overline{)711}$  237
8.  $7 \overline{)945}$  135

Multiply.

9.  $50 \times 0.1$  5.0
10.  $470 \times 0.01$  4.70
11.  $57 \times 0.1$  5.7
12.  $6938 \times 0.01$  69.38

Copy and complete.

13.  $100 \text{ cm} = \blacksquare \text{ dm}$  10
14.  $250 \text{ cm} = \blacksquare \text{ dm}$  25
15.  $1 \text{ km} = \blacksquare \text{ hm}$  10
16.  $320 \text{ hm} = \blacksquare \text{ km}$  32
17.  $1000 \text{ mL} = \blacksquare \text{ L}$  1
18.  $3 \text{ t} = \blacksquare \text{ kg}$  3000
19.  $1 \text{ km} = \blacksquare \text{ m}$  1000
20.  $1 \text{ cm} = \blacksquare \text{ mm}$  10
21. Write as centimetres.  
 $2 \text{ m} + 3 \text{ dm} + 1 \text{ cm} + 0 \text{ mm}$  231 cm
22. Write as decimetres.  
 $4 \text{ m} + 0 \text{ dm} + 7 \text{ cm} + 8 \text{ mm}$  40.78 dm
23. The Senior bicycle is 130 cm tall. The Junior bicycle is 1.1 m tall. How many centimetres taller is the Senior bicycle? 20 cm
24. Fernando worked 6 h a week doing yard work. At this rate, how many hours a year does he work? 312 h
25. Jose estimated the height of the stove to be 1.2 m. Millie estimated the height to be 0.9 m. The actual height is 99 cm. Whose estimate is the closest? Millie's
26. The temperature at 07:20 was 6.3°C. At 14:20 the temperature was 24.1°C. How many degrees did the temperature rise? 17.8°C
27. How many seconds in 3 min? 180 s
28. Estimate the length in metres of your classroom.

## Cumulative Review

1. Complete the table.

Enter	Display
99	88
76	65
50	39
48	■ 37
35	■ 24
17	■ 6

What is the rule? **Subtract 11**

2. Compare. Use  $<$ ,  $=$ , or  $>$

(a)  $429.72 \bullet 429.67$   **$>$**   
 (b)  $5203.6 \bullet 6230.2$   **$<$**

3. Add.

(a)  $4061.03$  (b)  $464\ 176$  (c)  $283$   
 $+2399.96$   $+322\ 903$   $14$   


---

 **$6460.99$**   **$787\ 079$**   **$165$**   
 $+72$   
 **$534$**

4. Subtract.

(a)  $625$  (b)  $4031$  (c)  $710\ 134$  (d)  $5600.03$   
 $-98$   $-1999$   $-200\ 469$   $-2032.16$   


---

 **$527$**   **$2032$**   **$509\ 665$**   **$3567.87$**

5. Multiply.

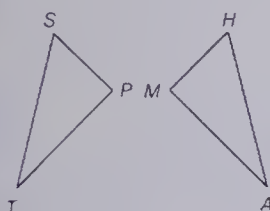
(a)  $169$  (b)  $621$  (c)  $316.2$  (d)  $141.21$   
 $\times 0.7$   $\times 23$   $\times 6$   $\times 0.5$   


---

 **$118.3$**   **$14\ 283$**   **$1897.2$**   **$70.605$**

6. Name the matching vertices in these congruent shapes.

**$S \rightarrow H$**   
 **$P \rightarrow M$**   
 **$T \rightarrow A$**



7. Write a number for each. (a)  **$1\ 568\ 000$**

(a) one million, five hundred sixty-eight thousand  
 (b) 9 thousands, 0 hundreds, 8 tens, 5 ones, 4 tenths  
 (c)  $30\ 000 + 1000 + 600 + 10 + 4 + 0.2 + 0.09$   
**(b)  $9085.4$**  **(c)  $31\ 614.29$**

8. Complete.

(a)  $3.8\text{ m} = \blacksquare\text{ cm}$   **$380$**  (b)  $5\text{ kg} = \blacksquare\text{ g}$   **$5000$**   
 $219\text{ cm} = \blacksquare\text{ m}$   **$2.19$**   $8000\text{ g} = \blacksquare\text{ kg}$   **$8$**   
 (c)  $2417\text{ mL} = \blacksquare\text{ L}$   **$2.417$**   
 $3.6\text{ L} = \blacksquare\text{ mL}$   **$3600$**

## OBJECTIVE

To review and test selected concepts and skills previously covered

## PACING

Level A All  
 Level B All  
 Level C All

## USING THE BOOK

This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a large number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic or, refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1	2
2	17
3	7, 21
4	3, 16, 21
5(a)	93
5(b)	86
5(c)	78
5(d)	94
6	56
7	25, 72
8(a)	110
8(b)	120
8(c)	119

# CHAPTER 5 OVERVIEW

This chapter briefly reviews division by a 1-digit divisor and then introduces division by a 2-digit divisor using multiples of 10. From this, the standard division algorithm is developed and extended to include 1-, 2- and 3-digit quotients.

Estimation and adjustment of estimates are emphasized. Sufficient practice is provided to promote confidence and competence with the division algorithm, before remainders are introduced. Procedures for checking division by multiplication are also introduced.

The measurement section of this chapter deals with area and volume using square centimetres, square metres, square kilometres, cubic centimetres, and cubic metres. Two strategies for finding both area and volume are presented: counting units and use of formulas. Finding the area of a right triangle (as half the area of a rectangle) is also briefly discussed.

## OBJECTIVES

- A To divide using 1- and 2-digit divisors
- B To check division using multiplication
- C To find the area of irregular shapes by counting, and to find the area of rectangles and triangles by calculating
- D To find volume by counting blocks and by calculating
- E To solve problems involving area, volume, and division

## BACKGROUND

The ability to divide in an efficient manner depends on a student's ability to understand and use effectively the skills necessary for the standard division algorithm.

These skills include:

1. the ability to follow the mechanical procedures required for the algorithm;
2. a solid understanding of place value;
3. initial estimates, possible adjustment of estimates, and successive estimates;
4. multiplication;
5. subtraction.

Most students would benefit from an on-going drill program which included review of basic facts, place value, rounding, and estimation.

## MATERIALS

construction paper	unit blocks
graph paper	centimetre cubes
dot paper	cubic metre (or materials to make this)

## CAREER AWARENESS

### Physicists [147]

Physicists (to differentiate them from, say, biologists or chemists) are usually involved with studying matter (i.e., the material from which things are made) and energy. They also study the interaction of these two upon one another.

Physicists are employed by large companies to conduct research into the design and development of their products. Modern jet engines, lighter and stronger building materials, computer hardware, communications satellites, optical fibres, laser technology, and countless items which we daily take for granted would not be available if it weren't for the physicists' expertise.

Physicists also work for governments and universities where they study: the more efficient use and storage of nuclear and solar energy; the design, materials, and building of safer and more dependable vehicles for moving people and products on Earth and in outer space; the solar system and the Earth's place in it; to mention just a few.

Physicists must, of course, be well aware of the theories and laws of science as they pertain to physics. They must be familiar with previous research and with the almost daily advances in new technology and in the body of scientific knowledge. Physicists must complete a lengthy school education before being formally admitted to a career which, in essence, is a never-ending learning process in itself.



## Division Puzzles

To find the hidden message:

- (a) Work each question (b) In your notebook write the letter which matches each answer

W 1. $35 - 7 = 5$	C 2. $18 - 3 = 6$	H 3. $24 - 6 = 4$	N 4. $14 - 7 = 2$
R 5. $81 - 9 = 9$	A 6. $180 - 6 = 30$	T 7. $200 - 5 = 40$	L 8. $70 - 2 = 35$
V 9. $560 - 7 = 80$	S 10. $100 - 10 = 10$	D 11. $32 - 4 = 8$	I 12. $48 - 2 = 24$
G 13. $720 - 8 = 90$	O 14. $500 - 10 = 50$	E 15. $36 - 3 = 12$	Y 16. $420 - 7 = 60$
K 17. $30 - 2 = 15$			

12 E 35 L 12 E 6 C 40 T 9 R 24 I 6 C 24 I 40 T 60 Y  
5 W 30 A 10 S 30 A 10 S 4 H 50 O 6 C 15 K 24 I 2 N 90 G  
8 D 24 I 10 S 6 C 50 O 80 V 12 E 9 R 60 Y

Complete the division to find the punch line!

W 1. $3 \overline{)72} = 24$	A 2. $4 \overline{)68} = 17$	N 3. $6 \overline{)210} = 35$	P 4. $5 \overline{)185} = 37$
I 5. $4 \overline{)944} = 236$	U 6. $8 \overline{)976} = 122$	E 7. $6 \overline{)1944} = 324$	T 8. $5 \overline{)1230} = 246$

Passer-by: You must be very brave to come down in a parachute during a windstorm like this!

Stranger: I didn't come down in a parachute.

236 I 24 W 324 E 35 N 246 T 122 U 37 P  
236 I 35 N 17 A 246 T 324 E 35 N 246 T



Division practice 133

## OBJECTIVE

To review division using a 1-digit divisor

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

windstorm

## RELATED AIDS

HMS — DM33.

## SUGGESTIONS

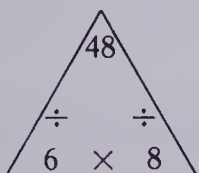
**Initial Activity** Before commencing this page, you may want to review the division skills taught so far (e.g., pages 101 to 109). The review might also include brief oral drills with basic multiplication and division facts.

## USING THE BOOK

Be sure that students understand the procedures for decoding the puzzles. You may wish to prepare and distribute an answer sheet of the "fill-in-the-correct-blank" variety to help the pupils keep track of their responses.

## ACTIVITIES

1. Some students might benefit from further drill on basic multiplication and division facts. Triangular flash cards provide an efficient device for practice.



a) Cover the "48" with your hand and the card shows  $6 \times 8 = \blacksquare$  or  $8 \times 6 = \blacksquare$ .

b) Cover the "6" or "8" and the card shows  $48 \div 8 = \blacksquare$  or  $48 \div 6 = \blacksquare$ .

2. Have students create their own puzzles. Unless students have had experience with this kind of activity, encourage them to start with simple words.

### Example

T (a) $4 \times 7 = \blacksquare$	C (b) $45 \div 9 = \blacksquare$
A (c) $24 \div 4 = \blacksquare$	
5	6 28

After sufficient practice, students could move to simple phrases and then to complete sentences. After assessing the completed puzzles, you might use them immediately for other students, or place them in a file for later use. Simple puzzles could be written on the chalkboard for a "Challenge of the Day".

3. Provide, or have students construct, appropriate function tables.

*Examples*

What's my rule?

(a)

Rule: ?	
Enter	Display
3	18
5	30
9	54
7	■
2	■
4	■
6	■
8	■

[Rule:  $\times 6$ ]

(b)

Rule: ?	
Enter	Display
45	5
27	3
63	7
18	■
36	■
81	■
54	■
72	■

[Rule:  $\div 9$ ]

## OBJECTIVE

To divide by multiples of 10 using the idea of related facts

## PACING

Level A 1-26  
Level B 1-26  
Level C All

## RELATED AIDS

BFA PROB. SOLVING LAB II — 66.

## BACKGROUND

The use of related facts as an aid to estimation when dealing with 2-digit divisors is based on a simple arithmetic rule: multiplication of the divisor and dividend by the same power of ten does not affect the quotient.

*Example*

$$35 \div 7 = \textcircled{5}$$

and

$$(35 \times 10) \div (7 \times 10)$$

$$= 350 \div 70$$

$$= \textcircled{5}$$

Similarly, division by a power of ten does not affect the quotient.

*Example*

$$320 \div 40 = \textcircled{8}$$

and

$$(320 \div 10) \div (40 \div 10)$$

$$= 32 \div 4$$

$$= \textcircled{8}$$

## SUGGESTIONS

**Initial Activity** Use an idea suggested by the pupil display as the basis for discussion about related facts. Ask students to explain how the zero zapper works. Most students will suggest that it removes the zero from the dividend and the divisor. You might point out to students that removal of the zeros is equivalent to division by 10 (see Background).

Demonstrate this further with a few chalkboard examples.

## USING THE BOOK

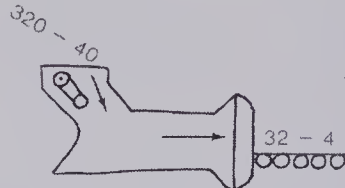
Exercises 1 to 15 use the number expression format, while Exercises 16 to 26 use the algorithm format. In both cases, it is intended that students complete each exercise by thinking about the simpler related fact and use that fact mentally to calculate the quotient.

Note that Exercises 27 to 30 involve division by multiples of 100 to produce the related fact.

## The Zero Zapper

David uses the zero zapper to help solve this problem.

$$320 \div 40$$



The zero zapper gives a related fact.

David knows this related fact:  $32 \div 4 = 8$   
He writes:  $320 \div 40 = 8$

Can you explain how the zero zapper works?

### Exercises

Think about the related fact for each problem, then complete the division sentence.

- |                                      |  |                            |                            |
|--------------------------------------|--|----------------------------|----------------------------|
| 1. $350 \div 70 \rightarrow$         | Think $35 \div 7 = 5$<br>$350 \div 70 = \blacksquare 5$                    | 2. $480 \div 60$ 8         | 3. $400 \div 50$ 8         |
| 4. $180 \div 30$ 6                   | 5. $210 \div 70$ 3   | 6. $420 \div 70$ 6         | 7. $240 \div 80$ 3         |
| 8. $360 \div 60$ 6                   | 9. $270 \div 90$ 3   | 10. $640 \div 80$ 8        | 11. $300 \div 60$ 5        |
| 12. $250 \div 50$ 5                  | 13. $560 \div 70$ 8  | 14. $280 \div 40$ 7        | 15. $360 \div 90$ 4        |
| 16. $20 \overline{)120} \rightarrow$ | Think 6<br>$2 \overline{)12} = 6$<br>$20 \overline{)120} = \blacksquare 6$ | 17. $60 \overline{)180}$ 3 | 18. $60 \overline{)240}$ 4 |
| 19. $90 \overline{)810}$ 9           | 20. $70 \overline{)420}$ 6   | 21. $80 \overline{)560}$ 7 | 22. $50 \overline{)450}$ 9 |
| 23. $60 \overline{)480}$ 8           | 24. $80 \overline{)400}$ 5   | 25. $30 \overline{)240}$ 8 | 26. $90 \overline{)630}$ 7 |
| ★27. $3500 \div 700$ 5               | ★28. $400 \overline{)3200}$ 8  | ★29. $4000 \div 800$ 5     | ★30. $6300 \div 700$ 9     |

134 Division: multiples of 10

## ACTIVITIES

1. Play "Concentration" (described in the Activity Reservoir) with eight pairs of matching cards.

*Examples*

$$320 \div 80 \longleftrightarrow 32 \div 8$$

$$4500 \div 900 \longleftrightarrow 45 \div 9$$

2. Write "What's Missing" exercises on the chalkboard and have students complete them.

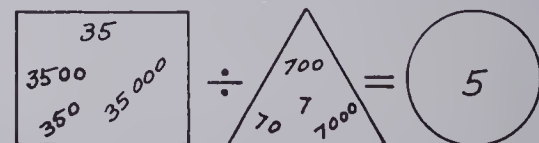
*Examples*

- (i)  $42 \div \blacksquare = 6$  (ii)  $3500 \div \blacksquare = 7$   
 $420 \div 70 = \blacksquare$   $\blacksquare \div 50 = 7$   
 $\blacksquare \div 700 = 6$   $35 \div 5 = \blacksquare$

3. Ask students to match dividends and divisors that give a particular quotient.

*Example*

Find pairs that give 5.



$$\begin{aligned} 35 \div 7 &= 5 \\ 350 \div 70 &= 5 \\ 3500 \div 700 &= 5 \\ 35000 \div 7000 &= 5 \end{aligned}$$



## Multiples of 10

Cindy knows how to use related facts.

$$60 \div 30 = 6 \div 3$$

$$80 \div 20 = 8 \div 2$$

She is given this division problem

$$60 \overline{) 420}$$

She thinks.  $6 \overline{) 42}$

She writes:

$$\begin{array}{r} 7 \\ 60 \overline{) 420} \\ \underline{420} \\ 0 \end{array}$$



### Exercises

Write a related fact for each

1.  $30 \overline{) 120}$

2.  $50 \overline{) 150}$     3.  $5 \overline{) 15}$     4.  $8 \overline{) 400}$     5.  $8 \overline{) 40}$

6.  $2 \overline{) 160}$     7.  $2 \overline{) 16}$     8.  $70 \overline{) 210}$     9.  $7 \overline{) 21}$     10.  $40 \overline{) 280}$     11.  $4 \overline{) 28}$     12.  $6 \overline{) 300}$     13.  $6 \overline{) 30}$

Complete

8.  $50 \overline{) 350}$     Related fact:  $5 \overline{) 35}$     Solution:  $50 \overline{) 350}$

$$\begin{array}{r} 7 \\ 50 \overline{) 350} \\ \underline{350} \\ 0 \end{array}$$

9.  $90 \overline{) 720}$     Related fact:  $9 \overline{) 72}$     Solution:  $90 \overline{) 720}$

$$\begin{array}{r} 8 \\ 90 \overline{) 720} \\ \underline{720} \\ 0 \end{array}$$

Divide. Use related facts.

10.  $40 \overline{) 240}$     11.  $60 \overline{) 420}$     12.  $40 \overline{) 200}$     13.  $70 \overline{) 280}$     14.  $90 \overline{) 360}$     15.  $50 \overline{) 400}$     16.  $30 \overline{) 270}$     17.  $40 \overline{) 160}$     18.  $60 \overline{) 180}$     19.  $70 \overline{) 350}$     20.  $30 \overline{) 180}$     21.  $80 \overline{) 640}$

Division: multiples of 10, algorithm form 135

## OBJECTIVE

To incorporate multiples of 10 and related facts into the division algorithm

## PACING

Level A All

Level B All

Level C All

## BACKGROUND

The skills developed on this and the preceding page may appear, at first glance, to be rather superficial. However, they play an important role in the estimation process for the division algorithm developed on pages 136 and 137.

## SUGGESTIONS

**Initial Activity** Write these three division questions on the chalkboard.

(a)  $40 \overline{) 160}$     (b)  $30 \overline{) 270}$     (c)  $60 \overline{) 300}$   
Ask students to identify the related fact for each one and complete each question using the regular division algorithm.

(a)  $40 \overline{) 160} \rightarrow \begin{array}{c} 4 \\ 4 \overline{) 16} \end{array} \rightarrow 40 \overline{) 160}$

$$\begin{array}{r} 4 \\ 40 \overline{) 160} \\ \underline{160} \\ 0 \end{array}$$

## USING THE BOOK

You may want to use Exercises 1 to 7 orally and assign Exercises 8 to 21 as independent work.

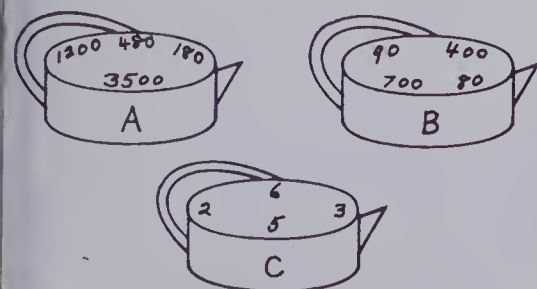
It is not intended that students should have to write the related facts for Exercises 10 to 21. Rather, they should identify the related fact mentally, then use that quotient to complete the algorithm.

## ACTIVITIES

1. Provide, or have students create, "Kettle Quotients".

**Example**

Match a dividend from Kettle A and a divisor from Kettle B to a quotient in Kettle C.



$$\begin{array}{l} 3500 \div 700 = 5 \\ 480 \div 80 = 6 \\ 180 \div 90 = 2 \\ 1200 \div 400 = 3 \end{array}$$

2. Have students write two related division sentences from a multiplication sentence.

**Example**

$$6 \times 700 = 4200$$

(i)  $4200 \div 6 = 700$

(ii)  $4200 \div 700 = 6$

3. Play the game "What's My Number?" Use it as a mental/oral activity to reinforce division and multiplication.

(a) I divided 120 by 40. What's my number? [3]

(b) I divided a number by 60 and got 4. What's my number? [240]

(c) I multiplied 40 by 50. What's my number? [2000]

(d) I multiplied 30 by a number and got 180. What's my number? [6]



## OBJECTIVE

To develop introductory estimating procedures for divisors and 1-digit quotients

## PACING

Level A All  
Level B All  
Level C All

## BACKGROUND

This page provides the final introductory stage for the division algorithm with a 2-digit divisor. Note that the steps outlined in the display at the top of the pupil page are based on work covered in previous pages and provide a rationale for the procedures which appear on page 137.

The three basic steps are intended to be done mentally.

1. **Rounding** Note that the divisor and dividend are rounded *down* to the nearest multiple of 10. This removes the digits from the one's column and replaces them with zeros without affecting the other digits. Notice that the resulting question closely resembles the questions on pages 134 and 135.

*Example*

$$32 \overline{)192} \longrightarrow 30 \overline{)190}$$

2. **Related Division Question** A related division question can be produced by removing the zero from the divisor and the dividend (i.e., by dividing each by 10). The related question is not necessarily a "basic fact", as was the case on pages 134 and 135, but is rather a "simpler fact" which makes estimation easier.

*Example*

$$30 \overline{)190} \longrightarrow 3 \overline{)19}$$

3. **Estimation** Using estimating skills, a suitable quotient is found for the related question. The thought processes are illustrated in the example.

*Example*

$$\begin{array}{l} 3 \overline{)19} \\ 3 \times 5 = 15 \text{ Too few} \\ 3 \times 6 = 18 \text{ Good choice} \longrightarrow 6 \\ 3 \times 7 = 21 \text{ Too many} \end{array}$$

The quotient selected is then used in the written part of the algorithm.

$$\begin{array}{r} 6 \\ 32 \overline{)192} \\ \underline{192} \\ 0 \end{array}$$

## SUGGESTIONS

**Initial Activity** Using a number of chalkboard examples, work through the steps outlined in the pupil display. Remind students that the steps leading

## Using Multiples of 10 to Divide

Divide.  $32 \overline{)192}$

Brenda rounds down the numbers to multiples of 10:  $30 \overline{)190}$

She thinks of a related division question:  $3 \overline{)19}$

She estimates:  $\begin{array}{r} 6 \\ 3 \overline{)19} \end{array}$

She uses this estimate in the original question:  $\begin{array}{r} 6 \\ 32 \overline{)192} \\ \underline{192} \\ 0 \end{array}$



### Exercises

Complete.

41  $\overline{)287}$

*She thinks:*

Round  $40 \overline{)280}$

Related question:  $4 \overline{)28}$

She writes:  $\begin{array}{r} 7 \\ 41 \overline{)287} \\ \underline{287} \\ 0 \end{array}$

23  $\overline{)138}$

*She thinks:*

Round  $20 \overline{)130}$

Related question:  $2 \overline{)13}$

She writes:  $\begin{array}{r} 6 \\ 23 \overline{)138} \\ \underline{138} \\ 0 \end{array}$

Divide.

32  $\overline{)224}$  7

7. 64  $\overline{)320}$  5

45  $\overline{)315}$  7

8. 22  $\overline{)176}$  8

5. 51  $\overline{)204}$  4

9. 34  $\overline{)238}$  7

6. 43  $\overline{)344}$  8

10. 73  $\overline{)292}$  4

136 • Division 2-digit divisor 1-digit quotient

to the written algorithm are to be done mentally.

During your demonstration, some students might suggest that they know a much easier procedure or shortcut.

*Example*

Ignore the digits in the one's column, estimate, then divide.

$$\begin{array}{r} 6 \\ 32 \overline{)192} \quad 32 \overline{)192} \\ \underline{192} \\ 0 \end{array}$$

This approach, in fact, is used on the following page (page 137). However, you might point out that the purpose of the current page is to demonstrate "how" and "why" such an estimation procedure works. In other words, an attempt to promote understanding is being made rather than strictly relying on a rote, mechanical procedure. Note that  $32 \overline{)192}$  is equivalent to

$$30 \overline{)190} \longrightarrow 3 \overline{)19}$$

## USING THE BOOK

Work cooperatively with the pupils on Exercises 1 and 2. Stress the "write" and "think" elements of the process.

Assign Exercises 3 to 10 for

independent work.

## ACTIVITIES

1. To review rounding skills, have the students help prepare "Round-It" cards as shown. The cards should be self checking and involve 2- and 3-digit numbers. Answers can be written on narrow strips of paper if necessary, or on the back of the same card.

Round It! (to nearest ten)	Answers
(a) 33 $\longrightarrow$ ?	(a) 30
(b) 48 $\longrightarrow$ ?	(b) 50
(c) 21 $\longrightarrow$ ?	(c) 20
(d) 77 $\longrightarrow$ ?	(d) 80
(e) 329 $\longrightarrow$ ?	(e) 330
(f) 562 $\longrightarrow$ ?	(f) 560
(g) 633 $\longrightarrow$ ?	(g) 630

Front

Back

2. Once they are familiar with the format, have pupils prepare their own "Round-It" cards and exchange them with a classmate.

## Using Estimates

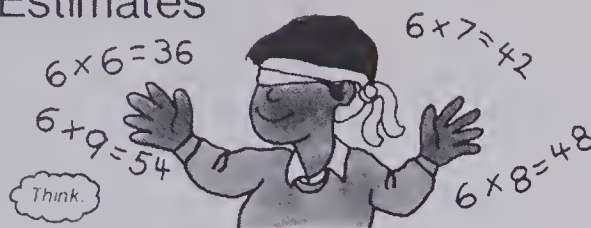
Brendan uses fewer steps by estimating.  
He works with this problem.

$$448 \div 64$$

Write:

$$\begin{array}{r} 7 \\ 64 \overline{)448} \\ \underline{448} \\ 0 \end{array}$$

$$448 \div 64 = 7$$



Step 1. Brendan estimates using the related fact

$$6 \overline{)44} \text{ is about } 7 \\ (6 \times 7 = 42)$$

### Exercises

Help Brendan to complete these.

●  $432 \div 54$

Write:

$$\begin{array}{r} \blacksquare 8 \\ 54 \overline{)432} \\ \underline{432} \\ 0 \end{array}$$

Think:

Step 1. Estimate.

$$5 \overline{)43} \text{ is about } \blacksquare 8 \\ (5 \times \blacksquare = \blacksquare)$$

●  $188 \div 47$

Write:

$$\begin{array}{r} \blacksquare 4 \\ 47 \overline{)188} \\ \underline{188} \\ 0 \end{array}$$

Think:

Step 1. Estimate.

$$\blacksquare \overline{)18} \text{ is about } \blacksquare 4 \\ (\blacksquare \times \blacksquare = \blacksquare)$$

Divide.

●  $43 \overline{)258} \quad 6$

7.  $22 \overline{)154} \quad 7$

11.  $35 \overline{)175} \quad 5$

15.  $72 \overline{)432} \quad 6$

19.  $51 \overline{)357} \quad 7$

●  $21 \overline{)168} \quad 8$

8.  $45 \overline{)135} \quad 3$

12.  $57 \overline{)228} \quad 4$

16.  $41 \overline{)328} \quad 8$

20.  $82 \overline{)410} \quad 5$

●  $37 \overline{)148} \quad 4$

9.  $33 \overline{)165} \quad 5$

13.  $48 \overline{)144} \quad 3$

17.  $73 \overline{)365} \quad 5$

21.  $68 \overline{)204} \quad 3$

●  $53 \overline{)265} \quad 5$

10.  $62 \overline{)248} \quad 4$

14.  $62 \overline{)496} \quad 8$

18.  $43 \overline{)387} \quad 9$

22.  $32 \overline{)288} \quad 9$

Division: 2-digit divisor, 1-digit quotient 137

## OBJECTIVE

To introduce more efficient estimating procedures for division with 2-digit divisors and 1-digit quotients

## PACING

Level A All

Level B All

Level C All

## BACKGROUND

The estimation procedure for this lesson has been significantly compressed.

Example

Think:

Write:

$$\begin{array}{r} ? \\ 64 \overline{)448} \end{array} \rightarrow \begin{array}{r} \cancel{6} \overline{)44\cancel{8}} \end{array} \rightarrow \begin{array}{r} 7 \\ 64 \overline{)448} \\ \underline{448} \\ 0 \end{array}$$

The rationale for this procedure has been established by work done on previous pages.

Think:

Think:

Think:

$$\begin{array}{r} ? \\ 64 \overline{)448} \end{array} \rightarrow \begin{array}{r} ? \\ 60 \overline{)440} \end{array} \rightarrow \begin{array}{r} ? \\ 6 \overline{)44} \end{array} \rightarrow \begin{array}{r} 7 \\ 6 \overline{)44} \\ \underline{42} \\ 2 \end{array}$$

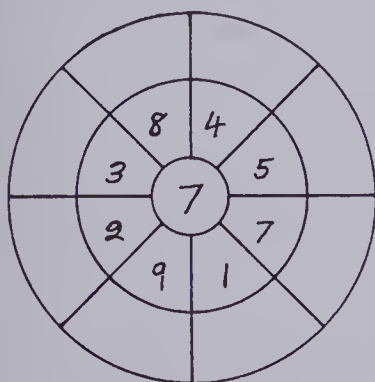
Write:

$$\begin{array}{r} 7 \\ 64 \overline{)448} \\ \underline{448} \\ 0 \end{array}$$

## ACTIVITIES

1. Practise using multiplication drill wheels and charts.

(a)

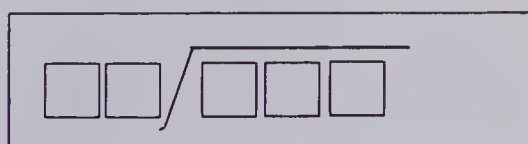


(b)

▲	8	9	2	3	5	7	4
●	14	37	68	49	57	42	72
▲×●							

2. Play the "Quotient Game" for two to four players. Remove the tens, jacks, queens, and kings from a deck of ordinary playing cards. Aces count as 1 (one). Have students prepare simple individual game boards on sheets of paper.

Example



Trace around an actual card so that each box is the proper size.

(a) Shuffle the cards and place them face down.

(b) The first player draws five cards and arranges them on the game board with digits running from greatest to least, from left to right.

Sample play. Cards drawn: 3, 8, 5, 4, and 5.

$$\begin{array}{r} 8 \ 5 \\ \overline{)5 \ 4 \ 3} \end{array}$$

(c) The first player, mentally using the related fact, announces the estimated quotient. Other players use the same procedure to check the first player's result.

$$\begin{array}{r} 6 \\ 85 \overline{)543} \end{array} \rightarrow \begin{array}{r} 8 \overline{)54} \end{array} \rightarrow \begin{array}{r} 8 \overline{)54} \end{array}$$

The quotient becomes that player's score for the round, e.g., 6.

(d) Play continues for each of the other players.

## SUGGESTIONS

**Initial Activity** Use the display at the top of the pupil page as a basis for discussion concerning the shortened estimation procedures. As you work through a number of chalkboard examples, you may want to demonstrate that Brendan's method, while much shorter, is equivalent to the procedure used on page 136 (see Background above).

## USING THE BOOK

Assign Exercises 1 and 2 and check the results before allowing students to proceed with Exercises 3 to 22.

All "Think" portions of the estimating procedures are intended to be done mentally. However, some students might benefit from showing the estimating method in writing for Exercises 3 to 6.

(e) The player with the greatest total score after four rounds wins the game.



## OBJECTIVES

To adjust estimates for a 1-digit quotient that are too large  
To practise the standard division algorithm

## PACING

Level A All  
Level B All  
Level C All

## SUGGESTIONS

**Initial Activity** This page provides examples of division questions whose initial estimated quotient will require adjustment. You might point out that estimates in division do not always provide the *correct* number; rather, estimates provide a *reasonable* number (a good place to start). Haphazard trial and error is far more time consuming than using estimation skills.

You might consider completing examples as shown in Exercises 1 and 2 on the chalkboard. Have students explain why the estimate in Exercise 1 needs to be adjusted. [Because  $8 \times 38 = 304$ , and 304 cannot be subtracted from 266 using the set of whole numbers.] Ask students to provide an adjusted estimate (i.e., 7).

Note that Exercise 2 does not require adjustment.

## USING THE BOOK

Assign Exercises 3 to 6 and check student results. Some students may require individual help and remediation. Assign Exercises 7 to 18, reminding students that not all division questions will need adjustment.

As you move about the room, take note of any strategies used by students to help make adjustments. After the exercises are corrected, you may want to discuss the various strategies with the whole class.

### Examples

1. Most students will multiply using the original estimate, discover that the product is too large, erase their work and use a lower estimate (as depicted in the display).

2. Some students may mentally multiply the estimate by the one's digit of the divisor, and find that the one's digit of the product does not match the one's digit of the dividend. Students then realize that the estimate must be lowered, using this new estimate for their written work.

## Adjusting Estimates

Sometimes an estimate is too large.  
Sandy is working with this problem.

$$234 \div 39$$

Write:

$$\begin{array}{r} 7 \\ 39 \overline{) 234} \\ \underline{273} \end{array}$$

Can't subtract!

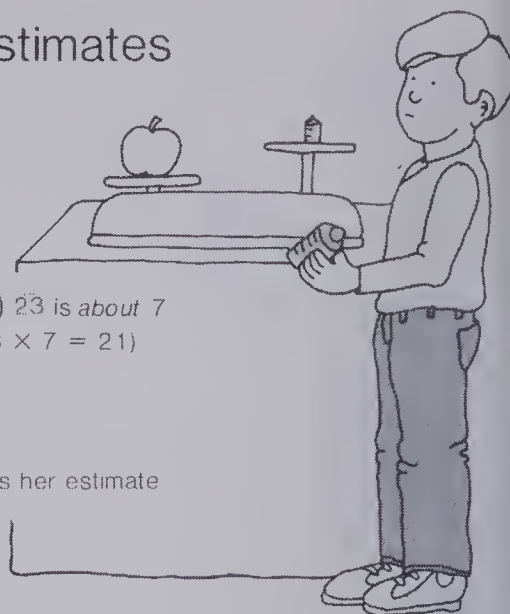
Think:

Step 1. Estimate.  $3 \overline{) 23}$  is about 7  
( $3 \times 7 = 21$ )

Step 2. Sandy lowers her estimate  
She tries 6.

$$\begin{array}{r} 6 \\ 39 \overline{) 234} \\ \underline{234} \\ 0 \end{array}$$

$$234 \div 39 = 6$$



### Exercises

Use the estimate provided. Adjust the estimate if necessary, then complete the division problem.

Write:  $266 \div 38$  7

$$\begin{array}{r} 8 \\ 38 \overline{) 266} \\ \underline{\phantom{00}} \end{array}$$

Think:

Estimate.  
 $3 \overline{) 26}$  is about 8.  
( $3 \times 8 = 24$ )

Write:  $344 \div 43$  8

$$\begin{array}{r} 8 \\ 43 \overline{) 344} \\ \underline{\phantom{00}} \end{array}$$

Think:

Estimate.  
 $4 \overline{) 34}$  is about 8.  
( $4 \times 8 = 32$ )

Divide. Some estimates will need adjustment, others will not.

1.  $58 \overline{) 464}$  8

7.  $78 \overline{) 312}$  4

11.  $45 \overline{) 225}$  5

15.  $87 \overline{) 783}$  9

2.  $64 \overline{) 448}$  7

8.  $69 \overline{) 483}$  7

12.  $79 \overline{) 237}$  3

16.  $48 \overline{) 288}$  6

3.  $87 \overline{) 435}$  5

9.  $57 \overline{) 456}$  8

13.  $29 \overline{) 116}$  4

17.  $78 \overline{) 546}$  7

4.  $27 \overline{) 135}$  5

10.  $67 \overline{) 201}$  3

14.  $36 \overline{) 252}$  7

18.  $33 \overline{) 297}$  9

138 Division adjusting estimates

Think:

Write:

$$\begin{array}{r} 9 \\ 58 \overline{) 464} \end{array} \rightarrow \begin{array}{r} 9 \\ 58 \overline{) 464} \\ \underline{522} \end{array} \rightarrow \begin{array}{r} 8 \\ 58 \overline{) 464} \\ \underline{464} \\ 0 \end{array}$$

$9 \times 8 = 72$

3. Other students may mentally round off the divisor to the nearest multiple of 10, multiply by the estimate and gauge that the estimate requires adjustment.

Think:

Write:

$$\begin{array}{r} 9 \\ 58 \overline{) 464} \end{array} \rightarrow \begin{array}{r} 9 \\ 60 \overline{) 464} \\ \underline{540} \\ 24 \end{array} \rightarrow \begin{array}{r} 8 \\ 58 \overline{) 464} \\ \underline{464} \\ 0 \end{array}$$

You may want to suggest to students that, while development of personal strategies is a very positive thing, they may not work on all division questions. For example, strategy 2 does not work if a remainder is involved or if there is a 2-digit quotient.

## ACTIVITIES

Prepare 16 division questions (or use the exercises listed on the page) and list them on the chalkboard. Have available matching estimate cards (i.e., cards which show what a reasonable estimate would be—for Exercise 3,  $50 \overline{) 460}$ ; for Exercise 4,  $60 \overline{) 440}$ ; etc.)

Ask the class or group randomly to write one of the division exercises from the list in each space on a  $4 \times 4$  grid. The leader selects an estimate card from the pile and identifies it aloud for the group. " $60 \overline{) 440}$ " Players find the appropriate exercise on the grid and cross it off. The first player to cross off 4 in a row is the winner and becomes the next leader.

Subsequent rounds can be played without rewriting the grid either by using coloured pencils and changing colours after each round, or by using counters or slips of paper to cover division questions as each is identified.



## Extending Division

Sandy works with 2-digit quotients too.  
Remember: estimates are sometimes too large!

Write:

$$\begin{array}{r} 9 \\ 45 \overline{) 3735} \\ \underline{405} \\ \text{Can't subtract} \end{array}$$

Step 1.

$$\begin{array}{r} 8 \\ 45 \overline{) 3735} \\ \underline{360} \\ 135 \end{array}$$

Step 2.

$$\begin{array}{r} 83 \\ 45 \overline{) 3735} \\ \underline{360} \\ 135 \\ \underline{135} \\ 0 \end{array}$$

Step 3.

$$3735 \div 45 = 83$$

Think:

Estimate.  
 $4 \overline{) 37}$  is about 9.  
( $4 \times 9 = 36$ )

Lower estimate.  
Try 8.

$4 \overline{) 13}$  is about 3.  
( $4 \times 3 = 12$ )

### Exercises

Divide. Some estimates will need adjustment

- |                               |                               |                               |                               |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| 1. $36 \overline{) 1836}$ 51  | 2. $48 \overline{) 1296}$ 27  | 3. $46 \overline{) 1104}$ 24  | 4. $58 \overline{) 2668}$ 46  |
| 5. $39 \overline{) 2028}$ 52  | 6. $66 \overline{) 2442}$ 37  | 7. $45 \overline{) 1170}$ 26  | 8. $53 \overline{) 1378}$ 26  |
| 9. $73 \overline{) 2117}$ 29  | 10. $41 \overline{) 1312}$ 32 | 11. $81 \overline{) 3645}$ 45 | 12. $27 \overline{) 1701}$ 63 |
| 13. $35 \overline{) 2240}$ 64 | 14. $31 \overline{) 1178}$ 38 | 15. $67 \overline{) 2747}$ 41 | 16. $75 \overline{) 1650}$ 22 |

Division 2-digit divisor 2-digit quotient 139

## OBJECTIVE

To introduce division with 2-digit divisors and 2-digit quotients

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

HMS — DM34.

## BACKGROUND

Division questions which have 2-digit (or more) quotients require a greater flexibility in rounding and estimation.

In the procedure for 1-digit quotients, both the divisor and dividend were rounded down to the nearest multiple of 10. Because 2-digit quotients imply partial quotients, rounding should be varied and extended to provide the most useful or practical estimate.

For example, to aid estimation, which of the following rounding procedures is the most practical?

$$44 \overline{) 3735}$$

Dividend rounded to the nearest:

- (a) ten?  $40 \overline{) 3730} \rightarrow 4 \overline{) 374}$   
 (b) hundred?  $40 \overline{) 3700} \rightarrow 4 \overline{) 37}$   
 (c) thousand?  $40 \overline{) 4000} \rightarrow 4 \overline{) 4}$

Obviously, (b)  $4 \overline{) 37}$ , is the most useful procedure for this example.

## MATERIALS

graph or lined paper (optional — see Using the Book)

## SUGGESTIONS

**Initial Activity** Use the example in the pupil display to demonstrate and clarify the procedure for division with 2-digit quotients.

**Example**

Ask: "How did Sandy arrive at an estimate of '9' in Step 1?" (See Background above.)

"Why did she lower her estimate in Step 2?"

"Why was the '8' placed in the ten's column?"

"Why did Sandy **Think**  $4 \overline{) 13}$  in Step 3?"

$$[45 \overline{) 135} \rightarrow 40 \overline{) 130} \rightarrow 4 \overline{) 13}]$$

## USING THE BOOK

Assign Exercises 1 to 4 and check the answers before assigning the remaining exercises. Some students may require a review of estimation procedures.

As the division algorithm becomes more complex, some students might benefit from using graph paper or lined paper turned vertically to help them keep the algorithm properly in line. This method also helps to emphasize place value.

### Graph Paper

				8	3	
4	5	3	7	3	5	
		3	6	0		
			1	3	5	
			1	3	5	
					0	

### Vertical Lines

				8	3	
4	5	3	7	3	5	
		3	6	0		
			1	3	5	
			1	3	5	
					0	

## ACTIVITIES

1. Have students complete partially worked "fill in the blanks" such as these.

(a) 
$$\begin{array}{r} \square \square \\ 49 \overline{) 2548} \\ \underline{24 \square} \\ 9 \square \\ \underline{\square \square} \\ 0 \end{array}$$

(b) 
$$\begin{array}{r} 4 \square \\ 32 \overline{) 1472} \\ \underline{\square \square \square} \\ 1 \square 2 \\ \underline{\square \square \square} \\ 0 \end{array}$$

2. After some practice, students might enjoy preparing their own "Mystery Box" division examples as in Activity 1 and exchanging them with other groups or classmates.

## OBJECTIVE

To solve mini-stories that involve division  
by 1- and 2-digit divisors

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

pogo stick, assembly line,  
merry-go-round, weightlifter

## SUGGESTIONS

**Initial Activity** If necessary, review Professor Q's four questions and the format that you have established for problem solving.

## USING THE BOOK

Read through the mini-stories together to be sure that everyone is familiar with the words (see Vocabulary).

Note that Exercise 7 is a 2-step problem.

## ACTIVITIES

1. Students might enjoy creating their own mini-stories. Some students may require assistance initially. Provide a number phrase and a theme which they can use in the creation of a mini-story.

*Example*

Using the phrase  $408 \div 24$  and the theme "model airplane kits", write a mini-story.

Other students may require less help.

*Example*

Find a picture in a magazine. Write a mini-story based on the picture using division.

## EXTRA PRACTICE

1. Supermarket.  
176 shopping carts.  
22 in each row.  
How many rows? [8]
2. Produce department.  
336 grapefruit.  
8 per bag.  
How many bags? [42]
3. Dairy department.  
912 eggs.  
12 per dozen.  
How many dozen? [76]
4. Frozen lemonade.  
756 tins stacked in the freezer.  
54 tins per layer.  
How many layers? [14]

## Mini-Stories

1. Pogo stick championships.  
3276 cm course.  
52 cm for each jump.  
How many jumps altogether? **63**

2. Pentagon.  
5 equal sides.  
Perimeter is 130 cm.  
How long is each side? **26 cm**

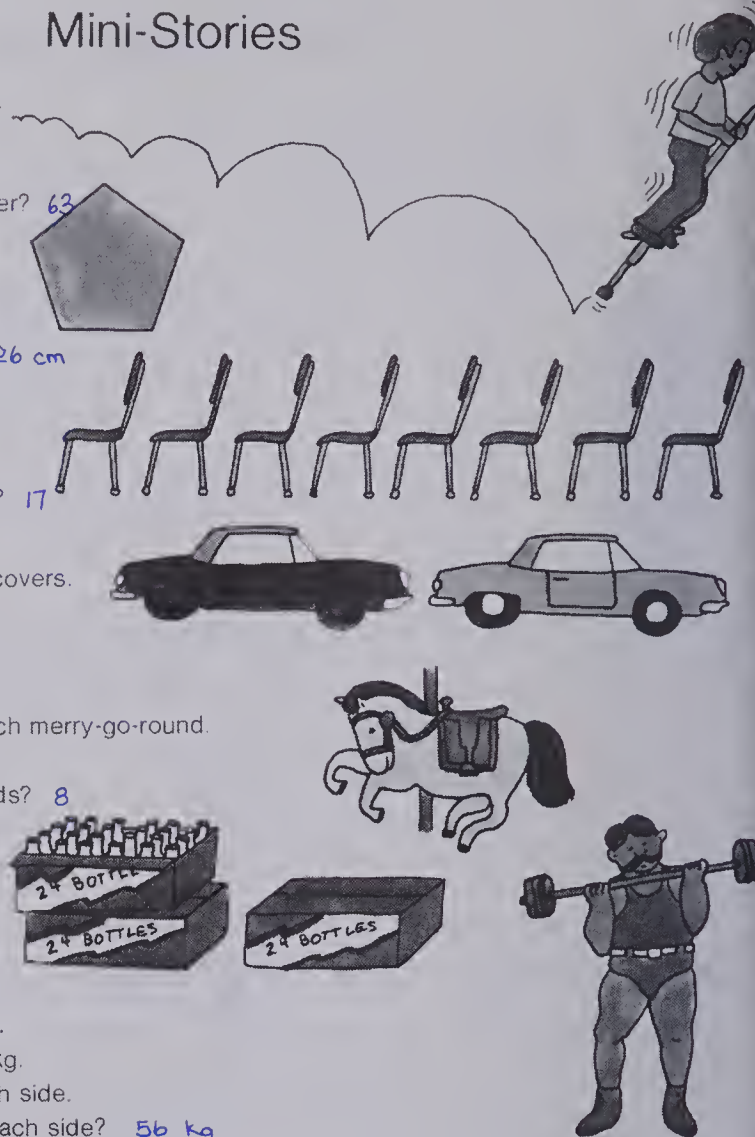
3. School play.  
20 chairs in each row.  
340 chairs altogether.  
How many rows of chairs? **17**

4. Assembly line.  
Each car needs 4 wheel covers.  
948 wheel covers.  
How many cars? **237**

5. Merry-go-round factory.  
27 wooden horses for each merry-go-round.  
216 wooden horses.  
How many merry-go-rounds? **8**

6. Empty bottle return.  
768 empty bottles.  
24 bottles in a case?  
How many cases? **32**

- ★7. Weightlifter.  
116 kg is total mass lifted.  
The bar has a mass of 4 kg.  
Equal iron masses on each side.  
How many kilograms on each side? **56 kg**



- ★5. Special on baked bread.  
2548 loaves sold in 1 month.  
91 loaves sold each day.  
Which month? [28 d,  
therefore February]



## Extending Estimates

The digits used for estimates will vary.

Notice Dianne's estimates as she works through these two examples.

$$7378 \div 34$$



$$884 \div 34$$

Write:

Think

Estimate

$$\begin{array}{r} 26 \\ 34 \overline{) 884} \\ \underline{68} \phantom{0} \\ 204 \\ \underline{204} \\ 0 \end{array}$$

$3 \overline{) 8}$  is about 2

$3 \overline{) 20}$  is about 6.

$$7378 \div 34$$

Write:

Think

Estimate.

$$\begin{array}{r} 217 \\ 34 \overline{) 7378} \\ \underline{68} \phantom{0} \\ 57 \phantom{0} \\ \underline{34} \phantom{0} \\ 238 \\ \underline{238} \\ 0 \end{array}$$

$3 \overline{) 7}$  is about 2.

$3 \overline{) 5}$  is about 1

$3 \overline{) 23}$  is about 7.

### Exercises

Complete.

$$\begin{array}{r} 3 \\ 24 \overline{) 768} \\ \underline{72} \phantom{0} \\ 48 \\ \underline{48} \\ 0 \end{array}$$

$2 \overline{) 7}$  is about 3.

$2 \overline{) 4}$  is about 2

$$\begin{array}{r} 14 \\ 26 \overline{) 3692} \\ \underline{52} \phantom{0} \\ 109 \\ \underline{104} \phantom{0} \\ 52 \\ \underline{52} \\ 0 \end{array}$$

$2 \overline{) 3}$  is about 1

$2 \overline{) 10}$  is 5.

(Why was 4 used?)

$2 \overline{) 5}$  is about 2

Divide

$$21 \overline{) 735} \quad 35$$

$$32 \overline{) 832} \quad 26$$

$$23 \overline{) 943} \quad 41$$

$$41 \overline{) 656} \quad 16$$

$$34 \overline{) 884} \quad 26$$

$$42 \overline{) 966} \quad 23$$

$$24 \overline{) 792} \quad 33$$

$$32 \overline{) 512} \quad 16$$

$$24 \overline{) 3216} \quad 134$$

$$27 \overline{) 8775} \quad 325$$

$$41 \overline{) 6683} \quad 163$$

$$35 \overline{) 7490} \quad 214$$

$$23 \overline{) 7176} \quad 312$$

$$45 \overline{) 5175} \quad 115$$

$$29 \overline{) 6467} \quad 223$$

$$42 \overline{) 6426} \quad 153$$

Division 2-digit divisor 2- and 3-digit quotients 141

## OBJECTIVE

To extend division and the appropriate estimation procedures to include 3-digit quotients

## PACING

Level A All

Level B All

Level C All

## RELATED AIDS

CALC. W/BK — 39.

## BACKGROUND

As noted in the Background on page 139, multi-digit quotients require some flexibility in rounding and estimation.

Division questions with 2- or 3-digit quotients will require 2 or 3 successive estimates respectively. The number of digits used in the dividend of each estimate is influenced by the particular usefulness of the estimate and ultimately whether, in estimate form, the dividend is divisible by the divisor. (See pupil display.) For instance, note the division question  $7378 \div 34$  (the second example in the display).

The first estimate ( $3 \overline{) 7}$ ) is most suitable because it is practical and also because the single-digit dividend is divisible by 3.

$$34 \overline{) 7378} \longrightarrow 30 \overline{) 7000} \longrightarrow 3 \overline{) 7}$$

In the third successive estimate of the same example, however, the estimate  $3 \overline{) 2}$  is neither practical nor possible (using the set of whole numbers). Therefore, a 2-digit dividend is used for the estimate.

$$34 \overline{) 238} \longrightarrow 30 \overline{) 230} \longrightarrow 3 \overline{) 23}$$

This reasoning ultimately leads to (and provides a rationale for) the rote procedure with which most people are familiar.

## SUGGESTIONS

**Initial Activity** Use the two examples in the pupil display to clarify the division steps and estimating procedures required for 2- and 3-digit quotients.

Some students may be quick to point out that they have developed an easy method for estimation.

$$23 \overline{) 138} \longrightarrow 2 \overline{) 1} \longrightarrow \text{No}$$

$$\longrightarrow 2 \overline{) 13} \longrightarrow \text{Yes}$$

The first digit of the dividend is tried and if it is not divisible by the rounded divisor, then the second digit is annexed to the first.

## USING THE BOOK

Take note of those students who are having difficulty with the exercises. Listed below are some of the more common problem areas with suggested remedial techniques.

1. Initial Estimate Show how you would "get started" by writing the estimate beside each question.

$$(a) 20 \overline{) 740} \quad 2 \overline{) 7} \quad (b) 38 \overline{) 9234} \quad 3 \overline{) 9}$$

2. Placement of Initial Estimate (Place Value) The initial estimate is given. Place it in the proper column. Use multiplication to help.

$$(a) 2. \quad \begin{array}{r} \text{h} \quad \text{t} \quad \text{o} \\ 30 \overline{) 780} \\ \underline{60} \phantom{0} \\ 180 \\ \underline{180} \\ 0 \end{array} \quad \text{Think:}$$

$$2 \times 30 = 60$$

$$20 \times 30 = 600$$

$$200 \times 30 = 6000$$

3. Adjusting Estimates These are taken from division questions. Which estimates will have to be adjusted?

$$(a) 21 \overline{) 19} \quad (b) 54 \overline{) 63} \quad (c) 196 \overline{) 214} \quad (d) 215 \overline{) 207}$$

$$[\text{NO}] \quad [\text{YES}] \quad [\text{YES}] \quad [\text{NO}]$$

4. Mechanical Errors in Multipli-

cation and Subtraction Provide drill with basic facts including oral and written types.

## ACTIVITIES

Play the "Tell Me" game. This game, designed as a mental activity, provides extra practice in some of the problem areas listed above.

Use division questions from exercises on preceding pages and write them on the chalkboard. For each example, say, "Tell me,"

$$23 \overline{) 9591}$$

(a) the first digit in the quotient [4]

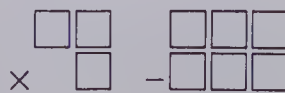
(b) the position of the first digit [hundred's column]

(c) the value of the first digit [400]

(d) how many digits in the quotient [three]

Score 1 point for each correct answer.

Prepare a spinner and blanks as shown to allow students to generate their own exercises for exchange with other groups or classmates.





## OBJECTIVE

To introduce division with a 1-digit divisor and a 3-digit quotient when the middle digit is a zero

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

seedlings, spruce, cedar

## SUGGESTIONS

**Initial Activity** Discuss the three steps presented in the pupil display. Ask students to explain what problem occurs in the second step. [The dividend is less than the divisor.] Zero is used as a placeholder in the quotient, and the division process continues.

## USING THE BOOK

Some students may be quick to see that the step involving multiplication by zero is not essential; therefore, they may be eager to omit the step altogether.

$$\begin{array}{r} 405 \\ 7 \overline{)2835} \\ \underline{28} \phantom{0} \\ 035 \\ \underline{35} \\ 0 \end{array}$$

If these students have a firm grasp of the procedure, you might suggest they omit the step outlined in the pupil display. Other students might benefit from including the step initially, then omitting it as they gain more confidence.

## ACTIVITIES

1. Reinforce place value by providing exercises requiring expanded notation. Include zeros.

*Example*

$$405 = (4 \times 100) + (0 \times 10) + (5 \times 1) \\ = 400 + 0 + 5$$

2. Challenge students and provide extra practice with multiplication and addition with this self-checking activity.

*Example*

Work each multiplication question, placing the products in the proper cells. Add horizontally, vertically, and diagonally. Is the figure a magic square? What is the "magic sum"?

- |                 |                |
|-----------------|----------------|
| A $2 \times 22$ | F $8 \times 5$ |
| B $8 \times 2$  | G $7 \times 4$ |
| C $6 \times 6$  | H $6 \times 8$ |
| D $2 \times 12$ | I $5 \times 4$ |
| E $4 \times 8$  |                |

## Forest Technician

A new forest!  
2835 pine seedlings.  
Marco tied them in bundles of 7.  
How many bundles altogether?

Write:


$$\begin{array}{r} 405 \\ 7 \overline{)2835} \\ \underline{28} \phantom{0} \\ 035 \\ \underline{35} \\ 0 \end{array}$$

Think:

$7 \overline{)28}$  is 4

$7 \overline{)03}$  ?  
(Try 0)

$7 \overline{)35}$  is 5.



Marco tied 405 bundles altogether.

---

**Exercises**

Complete.

$$\begin{array}{r} 70\text{ } \blacksquare \\ 6 \overline{)4218} \\ \underline{42} \phantom{0} \\ 01 \\ \underline{00} \\ 18 \\ \underline{18} \\ 0 \end{array}$$

$$\begin{array}{r} 509\text{ } \blacksquare \\ 5 \overline{)2545} \\ \underline{25} \phantom{0} \\ 04 \\ \underline{00} \\ 45 \\ \underline{45} \\ 0 \end{array}$$

$$\begin{array}{r} 306\text{ } \blacksquare \\ 9 \overline{)2754} \\ \underline{27} \phantom{0} \\ 05 \\ \underline{00} \\ 54 \\ \underline{54} \\ 0 \end{array}$$

Solve.

16. 1035 spruce seedlings.  
5 in each bundle.  
How many bundles altogether? **207**

17. 1624 cedar seedlings.  
8 in each bundle.  
How many bundles altogether? **203**

---

Divide.

1.  $7 \overline{)1435205}$

6.  $4 \overline{)2812703}$

8.  $5 \overline{)1535307}$

10.  $8 \overline{)7224903}$

12.  $3 \overline{)2118706}$

14.  $4 \overline{)1636409}$

2.  $3 \overline{)18276}$

7.  $8 \overline{)244035}$

9.  $6 \overline{)481883}$

11.  $9 \overline{)364545}$

13.  $7 \overline{)562183}$

15.  $6 \overline{)184830}$

142 Division 1-digit divisor, zero in the quotient

A	B	C
[44]	[16]	[36]
D	E	F
[24]	[32]	[40]
G	H	I
[28]	[48]	[20]

[Magic sum is 96.]

## EXTRA PRACTICE

1. 1224 spruce seedlings.  
4 in each bundle.  
How many bundles altogether? [306]

2. 2525 cedar seedlings.  
5 in each bundle.  
How many bundles altogether? [505]
3. 2118 pine cones.  
3 in each bag.  
How many bags altogether? [706]
4. 3663 poplar saplings.  
9 in each bundle.  
How many bundles altogether? [407]
5. 1456 plant trays.  
7 in each pile.  
How many piles altogether? [208]

## Roofing Tiles

Weekend job.  
3675 glazed roofing tiles.  
Max put them in piles of 35.  
How many piles altogether?

Write:

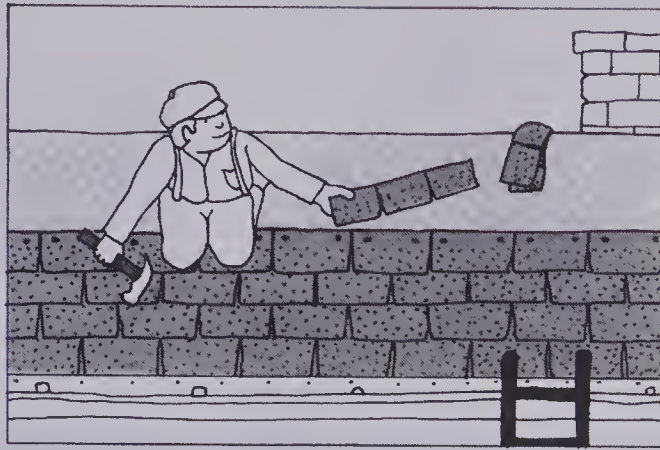
$$\begin{array}{r} 105 \\ 35 \overline{) 3675} \\ \underline{35} \phantom{00} \\ 17 \phantom{00} \\ \underline{00} \phantom{00} \\ 175 \\ \underline{175} \\ 0 \end{array}$$

Think

$3 \overline{) 3}$  is 1.

$\overline{) 17}$  0  
(Try 0)

$4 \overline{) 17}$  is 5.



Max made 105 piles altogether.

### Exercises

Complete

$$\begin{array}{r} 20 \overline{) 8858} \\ \underline{40} \phantom{00} \\ 48 \phantom{00} \\ \underline{40} \phantom{00} \\ 85 \phantom{00} \\ \underline{80} \phantom{00} \\ 58 \phantom{00} \\ \underline{56} \phantom{00} \\ 28 \phantom{00} \\ \underline{25} \phantom{00} \\ 3 \phantom{00} \end{array}$$

$$\begin{array}{r} 307 \overline{) 6447} \\ \underline{63} \phantom{00} \\ 14 \phantom{00} \\ \underline{14} \phantom{00} \\ 7 \phantom{00} \\ \underline{7} \phantom{00} \\ 0 \phantom{00} \end{array}$$

$$\begin{array}{r} 109 \overline{) 2725} \\ \underline{25} \phantom{00} \\ 22 \phantom{00} \\ \underline{22} \phantom{00} \\ 5 \phantom{00} \\ \underline{5} \phantom{00} \\ 0 \phantom{00} \end{array}$$

Divide. Some estimates will need adjustments, others will not

$$4. 34 \overline{) 6902203} \quad 5. 28 \overline{) 2996107}$$

$$6. 31 \overline{) 3317107} \quad 7. 37 \overline{) 3922106}$$

$$8. 41 \overline{) 4469109} \quad 9. 27 \overline{) 2808104}$$

$$10. 26 \overline{) 5408208} \quad 11. 36 \overline{) 3852107}$$

$$12. 21 \overline{) 8463403} \quad 13. 64 \overline{) 6720105}$$

$$14. 35 \overline{) 7210206} \quad 15. 52 \overline{) 5408104}$$

Solve.

16. 7650 roofing tiles.  
25 in each pile.  
How many piles altogether? **306**

17. 9315 roofing tiles.  
45 in each pile.  
How many piles altogether? **207**

Division: 2-digit divisor, zero in the quotient 143

## OBJECTIVE

To introduce division with a 2-digit divisor and 3-digit quotient when the middle digit is a zero

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

glazed roofing tiles

## SUGGESTIONS

**Initial Activity** Review the steps and procedure involved in division using a 1-digit divisor which yields a quotient including zero as presented on page 142. Have the students help complete one or two examples on the chalkboard (e.g.,  $2456 \div 8$  and  $3220 \div 4$ ). Stress the use of zero as a placeholder in the quotient.

Complete several examples of division involving a 2-digit divisor such as  $4646 \div 23$ ,  $9517 \div 31$ ,  $8844 \div 22$ . Be sure to stress the similarity between the process here and that used on pages 141 and 142.

## USING THE BOOK

Read through the roofing tile example in the display at the top of the pupil page. Point out that the information under "Think" shows what Max was thinking at each stage of the division example.

Complete Exercises 1 to 3 together, either as a chalkboard demonstration or as a guided exercise in workbooks, to reinforce what was discussed in the Initial Activity.

The answers for Exercises 1 to 5 are in the back of the student's book for those who wish to check their progress.

## ACTIVITIES

1. See the activities suggested for pages 141 and 142 for ideas which can be used here.

2. Have the students complete partially worked "fill-in-the-blank" division exercises such as this.

$$\begin{array}{r} \square\square\square \\ 33 \overline{) 6798} \\ \underline{\square 6} \phantom{00} \\ \square 9 \phantom{00} \\ \underline{\square} \phantom{00} \\ \square\square\square \\ \underline{1\square 8} \\ \square \end{array}$$

3. Students may enjoy preparing their own "Mystery Box" division examples as in Activity 2. Have them exchange their puzzles with other groups or classmates.



## OBJECTIVE

To use multiplication as a mechanical check for division

## PACING

Level A All  
Level B All  
Level C All

## SUGGESTIONS

**Initial Activity** Encourage students to talk about the ways in which the two tablets in the display are the same. Students who do not see the relationship might benefit from some simpler examples.

*Example*

$$\begin{array}{r} 5 \\ 7 \overline{) 35} \end{array}$$

$$5 \times 7 = 35$$

## USING THE BOOK

Have students indicate which division questions in Exercises 1 to 3 have been done correctly. Have students correct the one which has been done improperly. [Exercise 2]

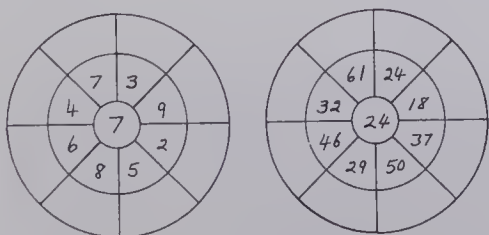
As students work through the remaining exercises, encourage them to develop a strategy to deal with a situation where the product does not equal the dividend. Ask, "Which one should I check first—the division or multiplication?" If the division has no remainder (which is true of these exercises), it is likely that an error has been made in the multiplication, so it would be wise to check that first.

Exercises 6 to 15 represent a sample of division questions developed so far. Listed below are the exercise numbers and the question types.

Exercise	Divisor	Quotient
6-9	1-digit	2-digit
10-13	2-digit	2-digit
14-15	2-digit	3-digit

## ACTIVITIES

1. Some students might benefit from extra practice with multiplication. Provide, or have students create, appropriate drill wheels.



2. Students who require extra practice with division could try this self-checking challenge.

A	B	C
[67]	[18]	[53]
D	E	F
[32]	[46]	[60]
G	H	I
[39]	[74]	[25]

[Magic sum is 138.]

3. Have students investigate the Unitate method for checking division.

## The Checking Stones

Professor R. K. Ology has discovered two stone tablets.



DIVISION



MULTIPLICATION



We can use multiplication to check division.

If the product equals the dividend, the division is correct.

### Exercises

Tell which division questions have been done correctly. #1 and #3

1.  $\begin{array}{r} 23 \\ 6 \overline{) 138} \\ 12 \phantom{00} \\ \hline 18 \phantom{00} \\ 18 \phantom{00} \\ \hline 0 \end{array}$

Check:  $\begin{array}{r} 23 \\ \times 6 \\ \hline 138 \end{array}$

2.  $\begin{array}{r} 36 \\ 8 \overline{) 272} \\ 24 \phantom{00} \\ \hline 32 \phantom{00} \\ 32 \phantom{00} \\ \hline 0 \end{array}$

Check:  $\begin{array}{r} 36 \\ \times 8 \\ \hline 288 \end{array}$

3.  $\begin{array}{r} 27 \\ 33 \overline{) 891} \\ 66 \phantom{00} \\ \hline 231 \phantom{00} \\ 231 \phantom{00} \\ \hline 0 \end{array}$

Check:  $\begin{array}{r} 27 \\ \times 33 \\ \hline 81 \\ 81 \phantom{00} \\ \hline 891 \end{array}$

Complete each division question. Check by multiplication.

4.  $\begin{array}{r} 25 \\ 7 \overline{) 175} \\ 14 \phantom{00} \\ \hline 35 \phantom{00} \\ 35 \phantom{00} \\ \hline 0 \end{array}$

Check:  $\begin{array}{r} 25 \\ \times 7 \\ \hline 175 \end{array}$

5.  $\begin{array}{r} 18 \\ 24 \overline{) 432} \\ 24 \phantom{00} \\ \hline 192 \phantom{00} \\ 192 \phantom{00} \\ \hline 0 \end{array}$

Check:  $\begin{array}{r} 18 \\ \times 24 \\ \hline 432 \end{array}$

6.  $\begin{array}{r} 36 \\ 8 \overline{) 288} \\ 64 \phantom{00} \\ \hline 160 \phantom{00} \\ 160 \phantom{00} \\ \hline 0 \end{array}$

7.  $\begin{array}{r} 53 \\ 5 \overline{) 265} \\ 25 \phantom{00} \\ \hline 15 \phantom{00} \\ 15 \phantom{00} \\ \hline 0 \end{array}$

8.  $\begin{array}{r} 34 \\ 6 \overline{) 204} \\ 12 \phantom{00} \\ \hline 84 \phantom{00} \\ 84 \phantom{00} \\ \hline 0 \end{array}$

9.  $\begin{array}{r} 62 \\ 9 \overline{) 558} \\ 54 \phantom{00} \\ \hline 18 \phantom{00} \\ 18 \phantom{00} \\ \hline 0 \end{array}$

10.  $\begin{array}{r} 35 \\ 24 \overline{) 840} \\ 48 \phantom{00} \\ \hline 360 \phantom{00} \\ 360 \phantom{00} \\ \hline 0 \end{array}$

11.  $\begin{array}{r} 45 \\ 36 \overline{) 1620} \\ 72 \phantom{00} \\ \hline 900 \phantom{00} \\ 900 \phantom{00} \\ \hline 0 \end{array}$

12.  $\begin{array}{r} 47 \\ 21 \overline{) 987} \\ 42 \phantom{00} \\ \hline 567 \phantom{00} \\ 567 \phantom{00} \\ \hline 0 \end{array}$

13.  $\begin{array}{r} 37 \\ 42 \overline{) 1512} \\ 84 \phantom{00} \\ \hline 672 \phantom{00} \\ 672 \phantom{00} \\ \hline 0 \end{array}$

14.  $\begin{array}{r} 215 \\ 26 \overline{) 5590} \\ 52 \phantom{00} \\ \hline 390 \phantom{00} \\ 390 \phantom{00} \\ \hline 0 \end{array}$

15.  $\begin{array}{r} 14 \\ 31 \overline{) 4402} \\ 62 \phantom{00} \\ \hline 1182 \phantom{00} \\ 1182 \phantom{00} \\ \hline 0 \end{array}$

144 Checking division, no remainders

### Example

Work each division question placing the quotients in the proper cells. Add horizontally, vertically, and diagonally. Is the figure a magic square? What is the "magic sum"?

A  $22 \overline{) 1474}$   
B  $43 \overline{) 774}$   
C  $36 \overline{) 1908}$   
D  $24 \overline{) 768}$   
E  $32 \overline{) 1472}$

F  $25 \overline{) 1500}$   
G  $28 \overline{) 1092}$   
H  $39 \overline{) 2886}$   
I  $57 \overline{) 1425}$

### Examples

(a)  $\begin{array}{r} 38 \rightarrow 11 \rightarrow 2 \\ 7 \overline{) 266} \rightarrow 14 \rightarrow 5 \quad 2 \times 7 = 14 \rightarrow 5 \\ 21 \phantom{00} \\ \hline 56 \phantom{00} \\ 56 \phantom{00} \\ \hline 0 \end{array}$

(b)  $\begin{array}{r} 47 \rightarrow 11 \rightarrow 2 \\ 21 \overline{) 987} \rightarrow 24 \rightarrow 6 \quad 2 \times 3 = 6 \\ 84 \phantom{00} \\ \hline 147 \phantom{00} \\ 147 \phantom{00} \\ \hline 0 \end{array}$

- Sum the digits of each of the divisor, dividend, and quotient until single-digit numbers are produced.
- Multiply the single-digit number of the quotient by the single-digit number of the divisor and sum the digits of the product.
- If this number matches the summed digits of the dividend, the division has been worked correctly.



## TV Towers

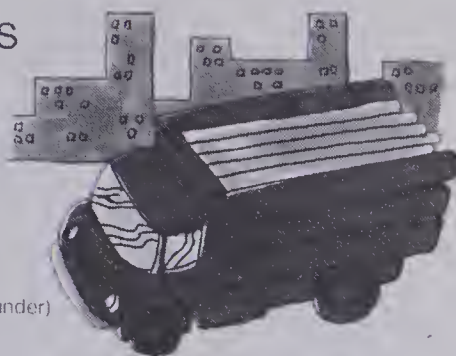
The Weber Construction Company is building a TV relay tower.

A truck delivered 275 pieces of steel.  
8 pieces are used for each section.  
How many sections can be built?  
How many pieces will be left over?

34 sections.

3 pieces left over.

$$\begin{array}{r} 34 \text{ R } 3 \\ 8 \overline{) 275} \\ \underline{24} \phantom{0} \\ 35 \\ \underline{32} \\ 3 \text{ (Remainder)} \end{array}$$



### Exercises

Complete.

$$\begin{array}{r} 6 \phantom{0} 3 \\ 2 \phantom{0} \text{ R } \phantom{0} \\ 7 \overline{) 185} \\ \underline{14} \phantom{0} \\ 45 \\ \underline{42} \\ 3 \end{array}$$

$$\begin{array}{r} 47 \phantom{0} 1 \\ \phantom{0} \text{ R } \phantom{0} \\ 6 \overline{) 283} \\ \underline{24} \phantom{0} \\ 43 \\ \underline{42} \\ 1 \end{array}$$

$$\begin{array}{r} 4 \phantom{0} 12 \\ 3 \phantom{0} \text{ R } \phantom{0} \\ 29 \overline{) 998} \\ \underline{87} \phantom{0} \\ 128 \\ \underline{116} \\ 12 \end{array}$$

Divide. Find (a) the number of tower sections. (Quotients)  
(b) the number of pieces left over. (Remainders)

1.  $5 \overline{) 456} \text{ 91 R } 1$     2.  $7 \overline{) 320} \text{ 45 R } 5$     3.  $6 \overline{) 507} \text{ 84 R } 2$     4.  $4 \overline{) 331} \text{ 82 R } 3$   
5.  $6 \overline{) 794} \text{ 132 R } 2$     6.  $8 \overline{) 2515} \text{ 314 R } 3$     7.  $4 \overline{) 859} \text{ 214 R } 3$     8.  $3 \overline{) 1387} \text{ 462 R } 1$   
9.  $21 \overline{) 152} \text{ 7 R } 5$     10.  $32 \overline{) 285} \text{ 8 R } 29$     11.  $26 \overline{) 138} \text{ 5 R } 8$     12.  $45 \overline{) 375} \text{ 8 R } 15$   
13.  $24 \overline{) 893} \text{ 37 R } 5$     14.  $41 \overline{) 1449} \text{ 35 R } 14$     15.  $32 \overline{) 770} \text{ 24 R } 2$     16.  $25 \overline{) 1580} \text{ 63 R } 5$   
17.  $35 \overline{) 7479} \text{ 213 R } 24$     18.  $22 \overline{) 7292} \text{ 331 R } 10$     19.  $37 \overline{) 5670} \text{ 153 R } 9$     20.  $26 \overline{) 3600} \text{ 138 R } 12$   
21.  $21 \overline{) 8509} \text{ 405 R } 4$     22.  $32 \overline{) 3341} \text{ 104 R } 13$     23.  $27 \overline{) 8270} \text{ 306 R } 8$     24.  $43 \overline{) 4582} \text{ 106 R } 24$

Division remainders 145

## OBJECTIVE

To introduce division with 1- and 2-digit divisors where remainders occur

## PACING

Level A First two exercises in each row  
Level B First two exercises in each row  
Level C First two exercises in each row

## RELATED AIDS

HMS — DM35.  
BFA COMP LAB II — 55, 56.

## BACKGROUND

All division questions to this point have had no remainders. The emphasis has been on developing competence and confidence in students with the division algorithm before introducing remainders.

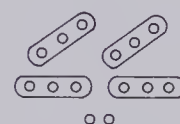
## SUGGESTIONS

**Initial Activity** You may want to begin this lesson by providing simple, concrete examples of remainders. Counters and arrays would provide suitable demonstrations.

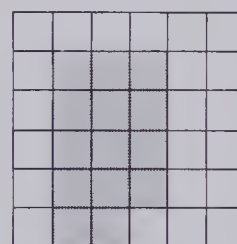
**Examples**

How many sets of 3 in 14?

Counters



Grid paper



X's



Four sets of 3 with 2 left over.

This leads to the algorithm form.

$$\begin{array}{r} 4 \text{ R } 2 \\ 3 \overline{) 14} \\ \underline{12} \\ 2 \end{array}$$

## USING THE BOOK

Assign the first two exercises in each row. Assign the others if extra practice is needed. Listed below are the exercises matched to the specific division type.

Exercise	Divisor	Quotient
4-7	1-digit	2-digit
8-11	1-digit	3-digit
12-15	2-digit	1-digit
16-19	2-digit	2-digit
20-23	2-digit	3-digit
24-27	2-digit	3-digit (with zero)

## ACTIVITIES

1. Using an overhead projector spinner (or a set of ten cards with the numbers 0 to 9 on each card), play the game "Greatest Quotient". Have students draw boxes or spaces appropriate to the division you wish to practice.

$\square \overline{) \square \square \square}$      $\square \square \overline{) \square \square \square \square}$

(a) Spin the spinner (or draw a card) to produce a digit. Students place that digit in any one of the boxes or spaces, keeping in mind that the object of the game is to make the greatest quotient.

(b) Repeat for other digits.

(c) Each student then divides to find his or her quotient. Students with the greatest quotient win. (Ignore

remainders for scoring purposes.)

**Sample Play.** Digits spun: 4, 9, 3, and 5.

$$\square \overline{) \square \square \square}$$

Player 1	Player 2	Player 3
$238 \text{ R } 1$	$318$	$78 \text{ R } 4$
$4 \overline{) 953}$	$3 \overline{) 954}$	$5 \overline{) 394}$

Player 2 wins!

**Variations:** (a) Play "Least Quotient" where the object of the game is to make the least quotient.

(b) Give bonus points to any player who, using the generated digits, makes a division question with no remainder.

2. See "Hopscotch" as described in the Activity Reservoir.

OBJECTIVE

To use the combined operations of multiplication and addition as a mechanical check for division when remainders occur

PACING

- Level A First two exercises in each row
- Level B First two exercises in each row
- Level C First two exercises in each row

RELATED AIDS

- HMS — DM36.
- BFA COMPLAB II — 55, 56.
- BFA PROB. SOLVING LAB II — 62, 82.

SUGGESTIONS

**Initial Activity** For the benefit of those students who do not see the necessity of adding the remainder to the product in the checking procedure, you may want to demonstrate using simpler examples.

*Examples*

(a) 
$$\begin{array}{r} 5 \text{ R } 2 \\ 4 \overline{)22} \\ \underline{20} \\ 2 \end{array}$$

Check

$$\begin{array}{r} 5 \\ \times 4 \\ \hline 20 \\ + 2 \\ \hline 22 \end{array}$$

(b) 
$$\begin{array}{r} 13 \text{ R } 1 \\ 7 \overline{)92} \\ \underline{7} \\ 22 \\ \underline{21} \\ 1 \end{array}$$

Check

$$\begin{array}{r} 13 \\ \times 7 \\ \hline 91 \\ + 1 \\ \hline 92 \end{array}$$

USING THE BOOK


Assign Exercises 1 to 3 for completion first. When the results have been checked, assign the first two questions in each row of the remaining exercises. Students requiring extra practice with a particular type of division question could be assigned the appropriate remaining exercises.

Listed below are the exercises matched with the particular division type.

Exercise	Divisor	Quotient
4-7	1-digit	2-digit
8-11	1-digit	3-digit
12-15	2-digit	2-digit
16-19	2-digit	3-digit
		(with and without zeros)
20-23	mixed	2-digit

ACTIVITIES

1. Those students who investigated the Unitate method for checking division as



### Checking With Remainders

Division with remainders can be checked too!!

Investigate these two stone tablets.

$$\begin{array}{r} 26 \text{ R } 3 \\ 7 \overline{)185} \\ \underline{14} \\ 45 \\ \underline{42} \\ 3 \end{array}$$

$$\begin{array}{r} 26 \\ \times 7 \\ \hline 182 \text{ (Product)} \\ + 3 \text{ Add the remainder} \\ \hline 185 \end{array}$$

**Exercises**

Complete each division. Check by multiplication.

$$\begin{array}{r} 42 \text{ R } 5 \\ 7 \overline{)299} \\ \underline{28} \\ 19 \\ \underline{14} \\ 5 \end{array}$$

Check

$$\begin{array}{r} 42 \\ \times 7 \\ \hline 294 \\ + 5 \text{ R} \\ \hline 299 \end{array}$$

$$\begin{array}{r} 28 \text{ R } 1 \\ 4 \overline{)113} \\ \underline{8} \\ 33 \\ \underline{32} \\ 1 \end{array}$$

Check

$$\begin{array}{r} 28 \\ \times 4 \\ \hline 112 \\ + 1 \text{ R} \\ \hline 113 \end{array}$$

$$\begin{array}{r} 32 \text{ R } 12 \\ 25 \overline{)812} \\ \underline{75} \\ 62 \\ \underline{50} \\ 12 \end{array}$$

Check

$$\begin{array}{r} 32 \\ \times 25 \\ \hline 800 \\ + 12 \text{ R} \\ \hline 812 \end{array}$$

Divide. Check by multiplication.

$$\begin{array}{l} 1. 4 \overline{)225} \text{ 56 R } 1 \\ 2. 6 \overline{)507} \text{ 84 R } 3 \\ 3. 7 \overline{)254} \text{ 36 R } 2 \\ 4. 5 \overline{)241} \text{ 48 R } 1 \\ 5. 6 \overline{)920} \text{ 153 R } 2 \\ 6. 4 \overline{)1226} \text{ 306 R } 2 \\ 7. 8 \overline{)995} \text{ 124 R } 3 \\ 8. 35 \overline{)639} \text{ 18 R } 9 \\ 9. 41 \overline{)1163} \text{ 28 R } 15 \\ 10. 27 \overline{)650} \text{ 24 R } 2 \\ 11. 32 \overline{)2347} \text{ 73 R } 11 \\ 12. 22 \overline{)3809} \text{ 173 R } 3 \\ 13. 42 \overline{)4420} \text{ 105 R } 10 \\ 14. 29 \overline{)6795} \text{ 234 R } 9 \\ 15. 31 \overline{)6391} \text{ 206 R } 5 \end{array}$$

Divide and check. Some have remainders, others do not.

$$\begin{array}{l} 16. 5 \overline{)367} \text{ 73 R } 2 \\ 17. 14 \overline{)882} \text{ 63} \\ 18. 47 \overline{)2483} \text{ 52 R } 39 \\ 19. 8 \overline{)264} \text{ 33} \end{array}$$

146 Division: checking with remainders

suggested in the Activities section on page 144 of the teaching notes might enjoy further exploration of that method with remainders.

$$\begin{array}{r} 38 \rightarrow 11 \rightarrow 2 \times 7 = 14 \rightarrow 5 \\ 7 \overline{)269} \rightarrow 17 \rightarrow 8 \\ \underline{21} \\ 59 \\ \underline{56} \\ 3 \text{ R} \end{array}$$

$$\begin{array}{r} 38 \\ \times 7 \\ \hline 266 \\ + 14 \text{ R} \\ \hline 280 \end{array}$$

$$\begin{array}{r} 5 \text{ R } 2 \\ 5 \overline{)27} \end{array}$$
$$\begin{array}{r} 5 \\ \times 5 \\ \hline 25 \\ + 2 \\ \hline 27 \end{array}$$

$$\begin{array}{r} 38 \text{ R } 2 \\ 12 \overline{)458} \end{array}$$
$$\begin{array}{r} 38 \\ \times 12 \\ \hline 456 \\ + 2 \text{ R} \\ \hline 458 \end{array}$$



## Physicists

- Mr. Wong needs 360 samples of steel for an experiment. There are 16 pieces in a carton.  
How many full cartons are needed? **22**  
How many extra pieces are needed? **8**
- Ms. Keer designs a structure requiring 3356 fasteners. The fasteners are available only in packages of 24.  
How many packages are required? **140**
- In a test to determine how well a particular component wears, the part was vibrated 2500 times in 40 s.  
How many vibrations per second was this? **62.5**
- A structure is made of 328 identical components each with a mass of 32 kg.  
What was the total mass of the structure? **10 496 kg**
- Mr Kerbie heated an engine component to  $235^{\circ}\text{C}$ . He then cooled it to  $85^{\circ}\text{C}$ .  
How many degrees did the temperature drop? **150°C**
- A wave in water travels at 1500 cm in 1 min.  
How far does it travel in 8 min? **12 000 cm**
- Light travels about 1 800 000 000 km in 1 min.  
How far would it travel in 1 s? **30 000 000 km**



Problems mixed operations 147

## OBJECTIVE

To solve word problems involving mixed operations

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

experiment, structure, fasteners, component, vibrated, identical

## SUGGESTIONS

**Initial Activity** See the Career Awareness notes in the Chapter Overview (page 132).

You may wish to review Professor Q's four questions (see page 4) and/or the problem-solving technique you use in your class.

## USING THE BOOK

Read through all of the word problems together and discuss vocabulary, the various experiment situations, and units of measure.

Be certain that the pupils are familiar with the accepted answer format that you use in your class.

## ACTIVITIES

1. See the "Choose the Correct Operation" idea in Activity 1 on page 4 of the teaching notes.

2. Have the students write some of their own "physicist" problems. If you have not done so already, see the teaching notes on page 26 and on pages 90-91.

3. Students might enjoy conducting their own experiments by measuring, recording, and graphing their results. The results could be presented to other groups or to the entire class.

Use "experiment" models such as:

- number of multiplication (or addition, subtraction, or division) facts correctly completed in writing in 30 s.
- number of cards included in card-house structure in 45 s.
- number of paper clips picked up using a hand-held magnet in one attempt.
- accuracy in estimating various masses, capacities, lengths of measurable classroom objects, etc.
- accuracy in estimating time segments (i.e., keep eyes closed for 45 s).
- number of bent-knee situps completed in 1 min.
- amount of time sustaining an "eyes at bar level" flexed-arm hang.



## OBJECTIVE

To practise division with remainders using a game format

## PACING

Level A All

Level B All

Level C All

## BACKGROUND

One of the more important aspects of drill is that it be purposeful. Games can provide an immediate purpose for computation in an informal atmosphere. The variety of activities, the immediate check on errors, the reward for accuracy, (and sometimes rewards for speed and strategy), and the active participation of everyone make games an excellent setting for practice.

## USING THE BOOK

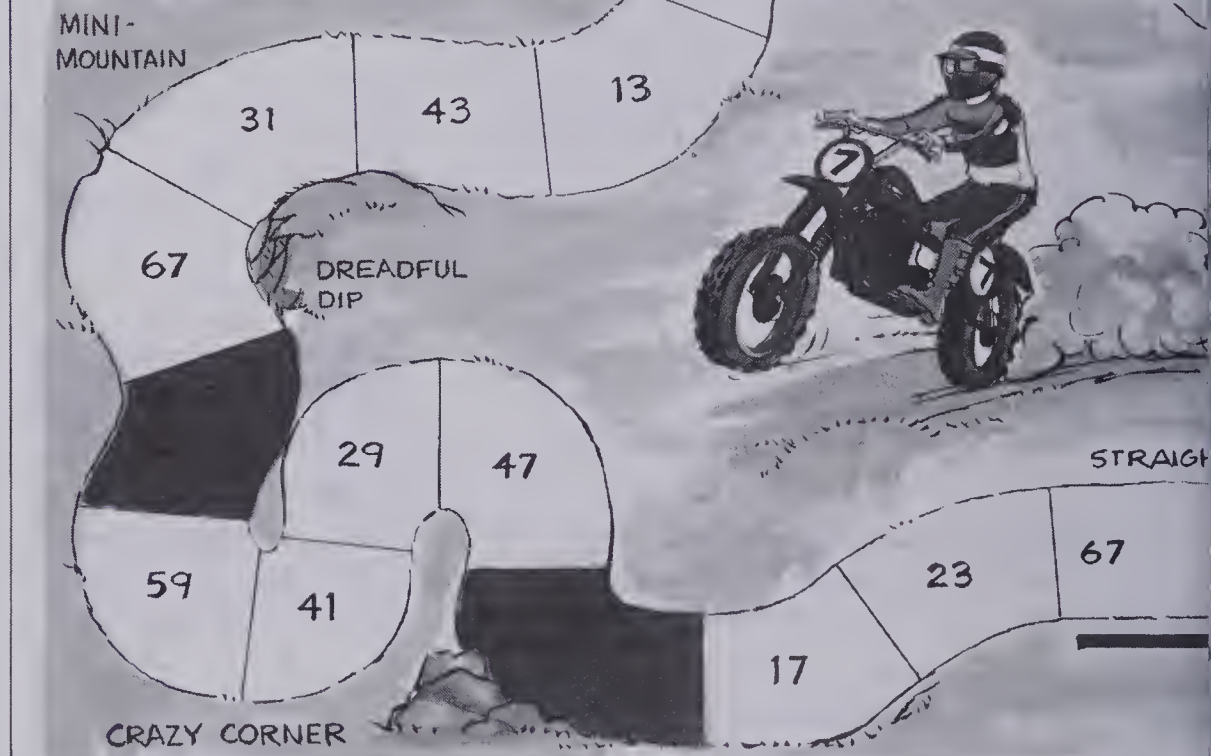
You may wish to make larger copies of the game on pieces of Bristol board. If you want to design your own track, please note that all numbers used on the track are *prime numbers* between 11 and 97. This ensures that a remainder always occurs. Consider the following suggestions:

- Set a time limit for the game(s) (20 to 40 min).
- Make sure students understand the rules.
- While the player calculates the remainder, encourage his or her opponents to do the same as a check on the player's computation. This also provides extra practice.
- Decide beforehand on an appropriate penalty for errors in division (e.g., player misses a turn, or moves back one or two spaces, etc.).

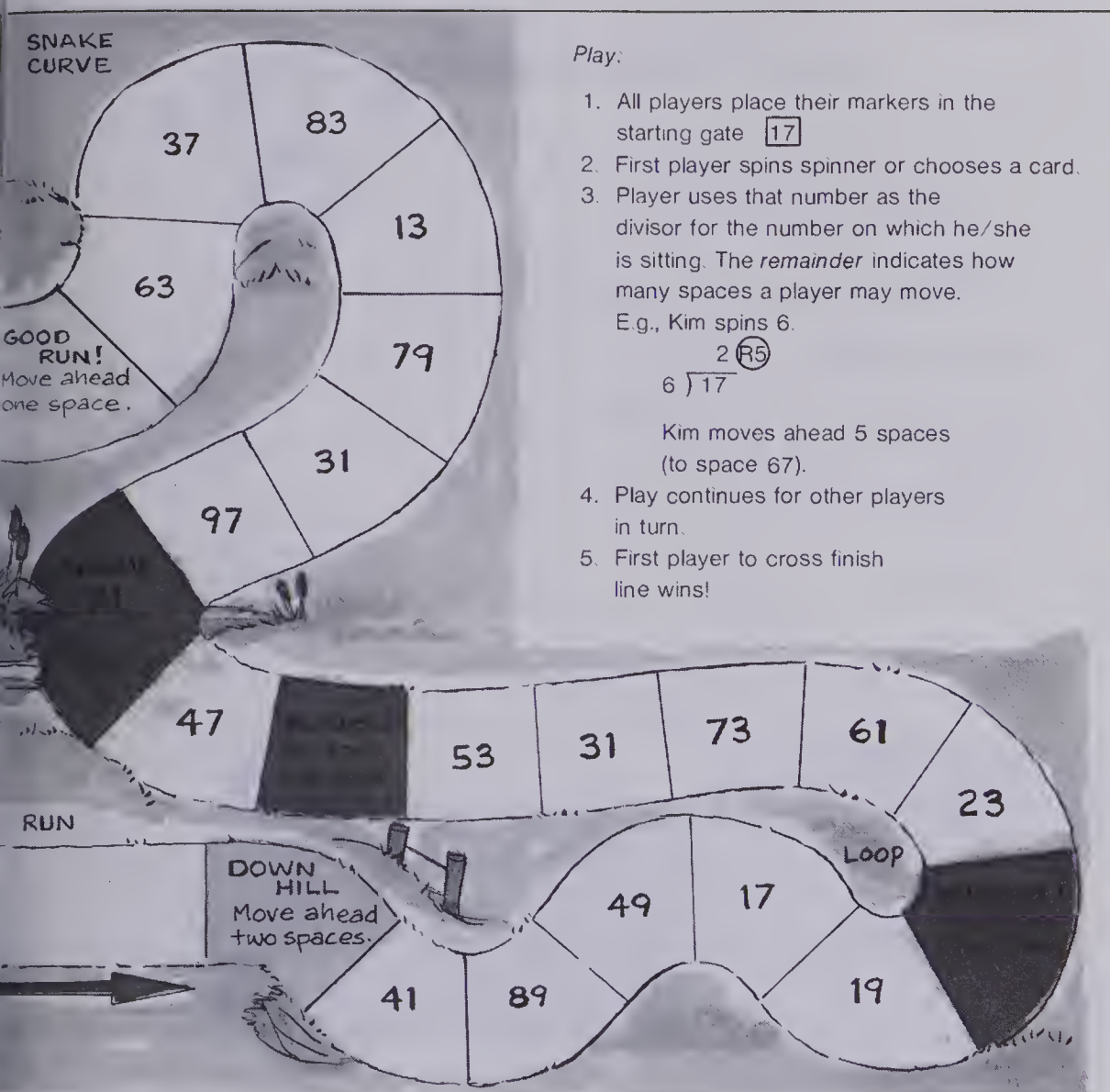
## Motocross!

### Equipment:

- \* A spinner with the numbers 2 to 9 or
- \* eight playing cards with the numbers 2 to 9, one on each card.
- \* Two to four coloured markers, one for each player.
- \* Scratch pad and pencil.



148 Activity: division



Play:

1. All players place their markers in the starting gate 17
2. First player spins spinner or chooses a card.
3. Player uses that number as the divisor for the number on which he/she is sitting. The *remainder* indicates how many spaces a player may move.

E.g., Kim spins 6.

$$\begin{array}{r} 2 \text{ R}5 \\ 6 \overline{)17} \end{array}$$

Kim moves ahead 5 spaces (to space 67).

4. Play continues for other players in turn.
5. First player to cross finish line wins!

## ACTIVITIES

1. Have students create their own board games. You may want to provide some simple guidelines.

- (a) Most board games have either an open or closed track with spaces.

Open



Closed



- (b) Movement along the track is usually dictated by a spinner, dice, cards, or the result of correctly answering some question. Movement is usually recorded by coloured markers.

- (c) To add interest and suspense, penalties and rewards occur at various places along the track. These are usually related to the theme of the game (e.g., boat game: torn sail — miss one turn).

- (d) Rules should be included as well as the object of the game. The winner is usually the player(s) who first achieves the objective.

2. Some students may wish to bring to class a favourite commercial game used at home. These students might explain and play the games with classmates.

## OBJECTIVE

To use division in various number activities

## PACING

Level A All

Level B All

Level C All

## USING THE BOOK

You might want to use the activities on this page as practice for the division algorithm using paper and pencil. If this is the case, suggest to students that they try any of the activities which appeals to them. If time permits, a second activity could be selected.

Alternatively, you may want to use the page to stress the development of interesting number patterns. In this case, you will probably want to provide calculators. Stress the pattern development over the mechanical calculations.

**Mysterious 9** The numbers will always be divisible by 9 with no remainders.

**Magic Remainders** The remainders will always be 6. If calculators are used, encourage students to try all *prime* numbers less than 100. Suggest, too, that they explore 3-digit prime numbers (e.g., 113, 119, and so on).

**Division Delights** The final answer will always equal the original 3-digit number selected. Some students may want to know how the "trick" works. Suggest that they multiply the three divisors and investigate the product (e.g.,  $7 \times 11 \times 13 = 1001$ ). Any 3-digit number multiplied by the product of 7, 11, and 13 (or 1001) will cause the digits to be repeated.

*Example*

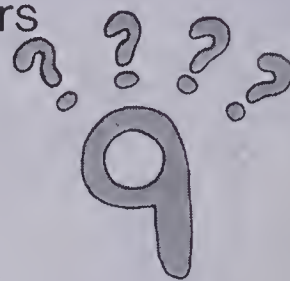
$$\begin{aligned} 245 \times 1001 &= (245 \times 1000) + (245 \times 1) \\ &= 245\,000 + 245 \\ &= 245\,245 \end{aligned}$$

Conversely, the division by the product of 7, 11, and 13 causes the original number to appear.

*Example*

$$245\,245 \div 1001 = 245$$

## Division Dazzlers



### MYSTERIOUS 9

1. Select any digits whose sum is 9.  $1 + 5 + 2 + 1$
2. Write them in any order. 2511
3. Divide by 9.
4. Try other digits. What did you notice? *No remainders.*

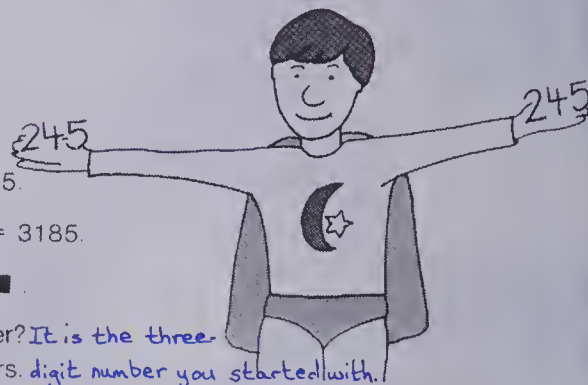
### MAGIC REMAINDERS

1. Select any *prime* number greater than 3.  
5, 7, 11, 13, 17, 19, 23, 29, ...
2. Multiply the number by itself.  $5 \times 5 = 25$
3. Add 17.  $25 + 17 = 42$
4. Divide by 12. 
$$\begin{array}{r} 3 \text{ R } 6 \\ 12 \overline{)42} \end{array}$$
5. Try these steps with other prime numbers in the list.  
What do you notice about the remainders?  
*The remainders are always 6.*



### DIVISION DELIGHTS

1. Select any 3-digit number. 245.
2. Repeat it. 245 245.
3. Divide by 7.  $245\,245 \div 7 = 35\,035$ .
4. Divide result by 11.  $35\,035 \div 11 = 3185$ .
5. Divide result by 13.  $3185 \div 13 = \blacksquare$ .
6. What do you notice about the final answer? *It is the three-digit number you started with.*





## Division Track and Field Events

Enter the division events. Watch for remainders!

High Jump

1. (a)  $5 \overline{)45} 9$  (b)  $7 \overline{)28} 4$  (c)  $7 \overline{)129} 18 R3$  (d)  $3 \overline{)81} 27$

60 m Dash

2. (a)  $6 \overline{)744} 124$  (b)  $8 \overline{)1883} 235 R3$  (c)  $9 \overline{)1926} 214$  (d)  $4 \overline{)1345} 336 R1$

100 m Hurdles

3. (a)  $7 \overline{)756} 108$  (b)  $4 \overline{)824} 206$  (c)  $6 \overline{)1828} 304 R4$  (d)  $9 \overline{)1845} 205$

Long Jump

4. (a)  $23 \overline{)161} 7$  (b)  $42 \overline{)351} 8 R15$  (c)  $35 \overline{)175} 5$  (d)  $56 \overline{)374} 6 R38$

100 m Sprint

5. (a)  $18 \overline{)491} 27 R5$  (b)  $31 \overline{)1333} 43$  (c)  $26 \overline{)837} 32 R5$  (d)  $37 \overline{)925} 25$

800 m Run

6. (a)  $24 \overline{)3264} 136$  (b)  $43 \overline{)9249} 215 R4$  (c)  $38 \overline{)6156} 162$  (d)  $54 \overline{)9412} 174 R16$

Relay Race

7. (a)  $33 \overline{)6732} 204$  (b)  $25 \overline{)7529} 301 R4$  (c)  $19 \overline{)7714} 406$  (d)  $47 \overline{)9823} 209$

Each correct answer is worth 1 point. What is your standing in each event?

	White Ribbon 1 point	Bronze Medal 2 points	Silver Medal 3 points	Gold Medal 4 points
High Jump				
60 m Dash				
100 m Hurdles				
Long Jump				
100 m Sprint				
800 m Run				
Relay Race				

## BRAINTICKLER

A worm is at the bottom of a 6 m hole. Every hour it crawls up 2 m and then rests 1 h.

While resting it slides back 1 m. How long before it reaches the top edge of the hole? **9 h**



Division practice 151

## OBJECTIVE

To practise and review division skills learned so far

## PACING

Level A All

Level B All

Level C All

## USING THE BOOK

This practice page contains samples of the various division types introduced so far. Questions with remainders are placed intermittently throughout.

Exercise	Divisor	Quotient
1	1-digit	1- and 2-digit
2	1-digit	3-digit
3	1-digit	3-digit (with zero)
4	2-digit	1-digit
5	2-digit	2-digit
6	2-digit	3-digit
7	2-digit	3-digit (with zero)

This page can be used in a number of ways:

- to provide extra practice in all the aspects of division skills learned so far. In this case, allow students at least 2 or 3 sittings to complete the page. A specific time limit is not intended.
- to provide extra practice in some aspects of division. In this case, assign only those sets which reflect the skills you think require more practice.
- to diagnose specific division skills. For example, if a student has difficulty with set 4, then review with that student the steps required for division with a 2-digit divisor.
- to indicate mastery of specific division skills. A score of 3 out of 4 gives a strong indication that a student has mastered the skill reflected in a particular set. A score of 2 or less indicates a probable need for remediation.

While some of these uses complement each other, it is important that you decide which use(s) you intend to make of the page before assigning it to students.

## ACTIVITIES

1. You may wish to prepare and distribute a graph as shown at the bottom of the pupil page so that students can more easily record their results.

2. Provide spinners, cards, or dice to enable the pupils to generate their own division exercises. You may wish to supply blanks, as shown, to help keep the exercises of the right type.

$$\square \overline{) \square \square \square}$$

Students can exchange them with other groups or classmates.

3. Use the cards made by students

in Activity 2 to play "500". Two to four players create three exercises each and place them on cards or pieces of paper with enough room for computation. Cards are well mixed and placed face down on a desk. Each player selects three cards and completes the various calculations. Players, then, add their three quotients. The player closest to 500 wins.

**Variations:** (a) Play the game with the winner being the player who's total is furthest from 500.

(b) Play the original game. The winner, though, is the player whose total is greatest (or least).

## OBJECTIVE

To review and maintain skills involved in estimating, converting from one metric linear unit to another, multiplication, calculating perimeter, and adding and subtracting large numbers

## PACING

Level A All  
Level B All  
Level C Optional

## USING THE BOOK

If the students have difficulty with these problems, you might provide appropriate remedial work. This chart shows where each topic was introduced in the text.

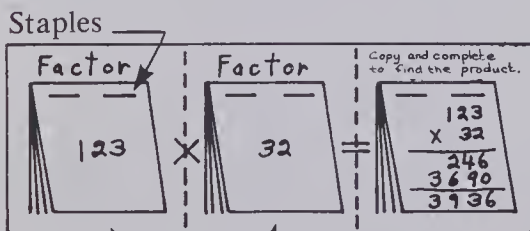
Exercise	Page
1-5, 9-10	110-112, 129
6, 11	115
7-8	113
12-13	94
16-18	116
19, 21	12
20-22	21

You may wish to have each student predict how they will "shape up" (as indicated at the bottom of the pupil page) before they actually begin the exercises.

## ACTIVITIES

1. Play "Slalom" or "Spider and the Fly" as described in the Activity Reservoir.

2. Students might enjoy preparing "Fact Folders" for themselves or for exchange with classmates. Make the booklets as shown. Use different colours of construction paper for each booklet.



Several pages with different numbers on each page stapled to a stiff larger sheet.

Several blank pages upon which answers may be calculated.

Students carry out the various computations. Encourage periodic checking with a calculator. Similar folders or one modifiable folder can be used for the other operations.

## Tune Up

Estimate to the nearest centimetre.



2. The height from the floor to your shoulder when you are standing.

3. Estimate to the nearest millimetre. **44 mm**



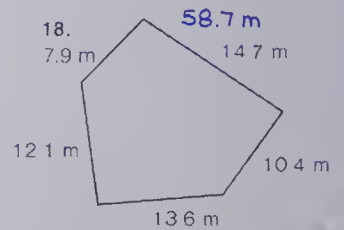
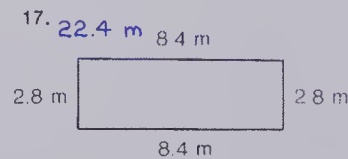
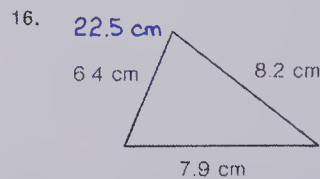
Copy and complete.

4.  $1 \text{ m} = \frac{10}{100} \text{ dm}$  5.  $1 \text{ m} = \frac{100}{1000} \text{ cm}$  6.  $1 \text{ m} = \frac{1000}{10000} \text{ mm}$  7.  $1 \text{ km} = \frac{1000}{10000} \text{ m}$   
8.  $1450 \text{ m} = \frac{1.45}{1000} \text{ km}$  9.  $250 \text{ cm} = \frac{2.5}{100} \text{ m}$  10.  $340 \text{ dm} = \frac{34}{1000} \text{ m}$  11.  $46 \text{ mm} = \frac{4.6}{1000} \text{ m}$

Multiply.

12.  $3.1 \times 4.2$  **13.02** 13.  $32.45 \times 3.7$  **120.065** 14.  $12 \times 13 \times 6$  **936** 15.  $2.3 \times 4.5 \times 6.7$  **69.345**

Calculate the perimeter.

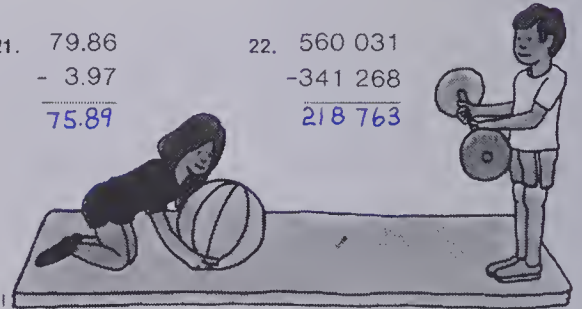


Calculate.

19.  $53.46 + 9.58 = 63.04$  20.  $839\ 056 + 430\ 026 = 1\ 269\ 082$  21.  $79.86 - 3.97 = 75.89$  22.  $560\ 031 - 341\ 268 = 218\ 763$

How did you measure up?

- 25 - 22 correct TOP SHAPE  
21 - 18 correct Practice?  
17 - 14 correct Practice needed.  
13 or less correct Practice very important!

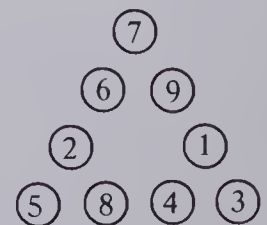
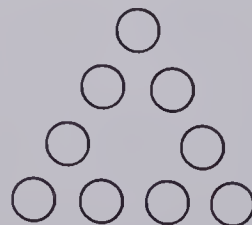
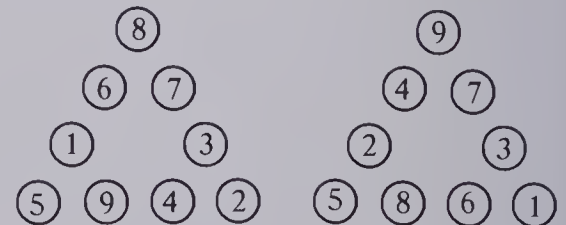


152 Practice

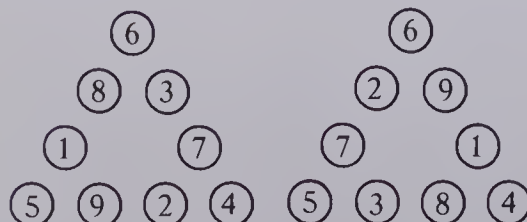
## EXTRA PRACTICE

Use the numerals 1 to 9 to make magic triangles. A magic triangle is one in which the sums of the sides are equal. Make 5 triangles in which:

- (a) the sum of the vertices is 15  
(b) the sum of a side is 20.

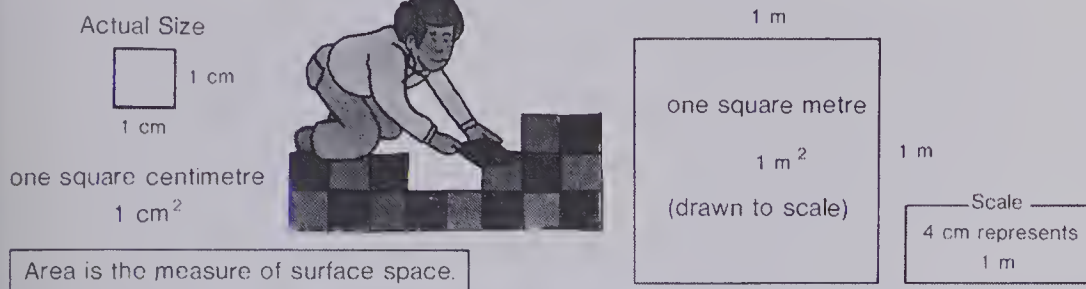


Answers



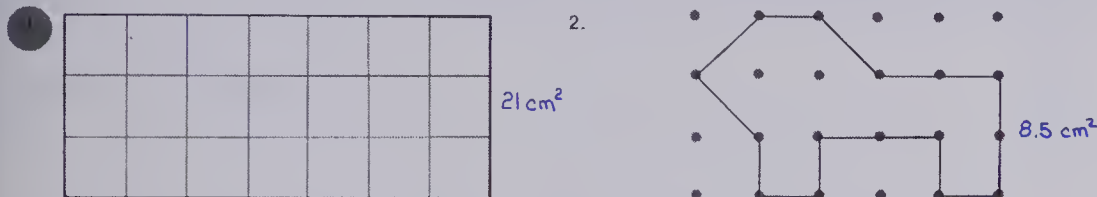


# Square Centimetre and Square Metre

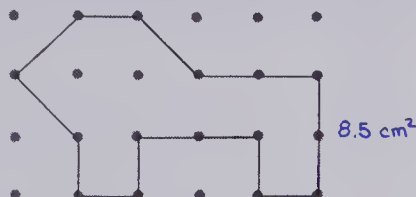


## Exercises

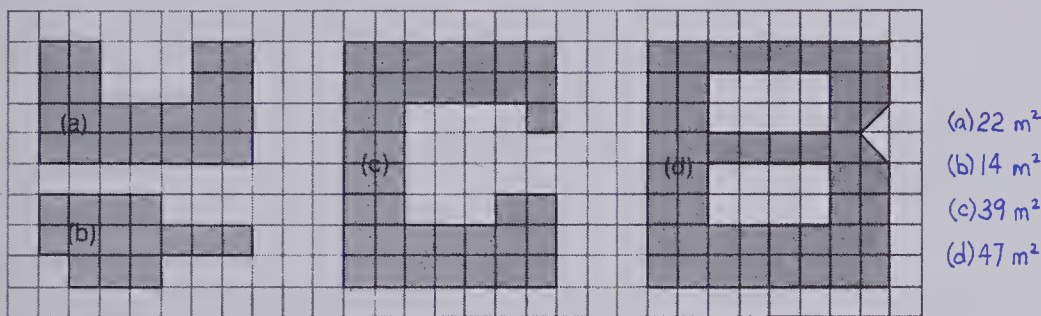
What is the area in square centimetres?



2.



3. Each square represents a square metre. What is the area of each?



4. Make one square metre using newspaper.  
How many students can stand on one square metre?

Square centimetres and square metres 153

## OBJECTIVE

To use square centimetres and square metres as units of area

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

$\text{cm}^2$ ,  $\text{m}^2$

## MATERIALS

paper for making centimetre and metre squares

## RELATED AIDS

HMS — DM13 and DM46.

## BACKGROUND

Two standard units of area are the square centimetre and the square metre. A square metre is a unit of area equivalent to a square of 1 m on each side. The equivalence aspect is important: it may be a rectangle 2 m on one side and 0.5 m on the other.

## SUGGESTIONS

- Initial Activity** Students should actually cover a surface with non-standard and standard unit areas before calculating area. If your class seems insecure in this topic:
- provide them with nonstandard unit areas (about 10 cm or 15 cm on each side). Ask students to cover the top of their desks (or yours) to find how many units are needed to cover the area.
  - provide students with  $1 \text{ cm}^2$  units to cover the figures in the exercises. They will need to cut some in half for Exercise 2.
  - provide students with  $1 \text{ m}^2$  units to cover areas previously marked out on the floor, in the hall, or on the chalkboard (using tape). It may be necessary to cut some to fit, but keep track of how many are cut.

## USING THE BOOK

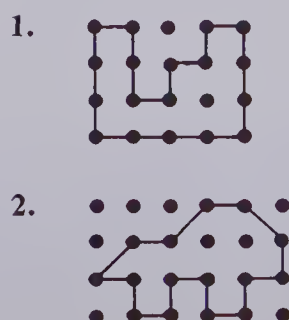
Discuss the display at the top of the pupil page and emphasize the names of the two units along with their symbols. Emphasize that we use a numeral and a symbol, i.e.,  $2 \text{ m}^2$  and not "2 square metres" or "two  $\text{m}^2$ ". We can also use all words, i.e., "two square metres".

## ACTIVITIES

- Provide students with centimetre square paper (HMS — DM46). Ask each to draw a shape and colour it. Calculate the area of the coloured part.
- Provide a geo-board to each of two students. The first student makes a pattern as in Exercise 1. The second student calculates the area. If the answer is correct, the second student makes a shape and challenges the first, and so on.
- Provide students with grid paper (HMS — DM46). Ask them to make their initials in block letters. Each is to calculate the area of his or her initials.

## EXTRA PRACTICE

Using dot paper (HMS — DM13), make up a series of diagrams similar to these. Students are to calculate the area of each.





## OBJECTIVE

To use a square kilometre as a unit of area

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

approximation

## RELATED AIDS

HMS — DM46.

## BACKGROUND

Exercises 1 to 3 provide a way to estimate the area of a shape that does not conform to the square grid. This method will be used later when dealing with the area of a circle.

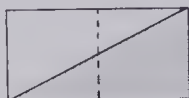
## SUGGESTIONS

**Initial Activity** On the overhead projector show that we can find areas by counting and adding half units and half of two units (which is one unit).

*Example*



0.5 unit shaded



1 unit shaded

## USING THE BOOK

Discuss and do Exercises 1 to 3 orally. Use the overhead projector to show Exercise 1 in yellow and Exercise 2 in blue. The area in Exercise 3 is between the values found in Exercise 1 and Exercise 2.

Assign Exercises 4 to 7. Draw attention to the scale used in Exercise 4.

## ACTIVITIES

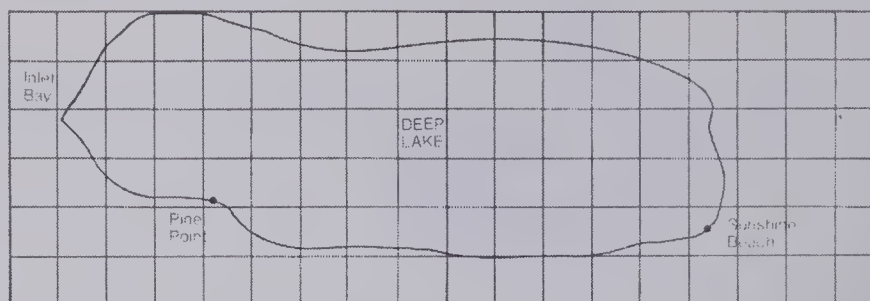
1. Provide students with square grid paper (HMS — DM46). Each student draws a pattern. Students exchange patterns and each calculates the area of a pattern.

2. Provide students with a  $4 \times 4$  square grid and this challenge. Colour the grid with red, blue, and yellow squares. There are three times as many blue as yellow; four times as many red as yellow. How many squares will there be of each colour? [6 blue, 8 red, 2 yellow]

## EXTRA PRACTICE

Prepare for each student a duplicate sheet of irregular shapes drawn on grid

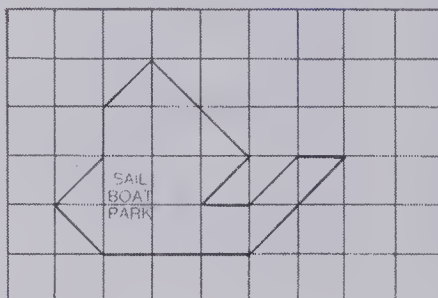
## Square Kilometres



Bill had this map of Deep Lake. Each square represents a square kilometre.

### Exercises

- Count the number of squares totally within the lake **35**
- Count the number of squares in or touching the lake **69**
- An **approximation** for the area of the lake is between the two answers in Exercises 1 and 2.  
What is the approximate area of Deep Lake? **52 km<sup>2</sup>**
4. Count the squares and half squares to get the area of the park. **11.5 km<sup>2</sup>**



Each square stands for one square kilometre.



Find the area in square units

2 square units



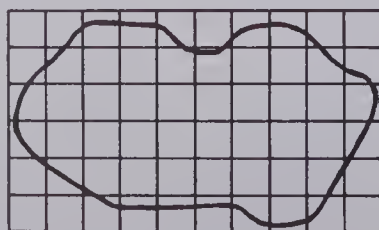
2.5 square units



6.5 square units



paper (HMS — DM46). Students are to calculate the approximate area by the method illustrated by Exercises 1, 2, and 3.



## Area of a Rectangle

We can find the area of a rectangle in two ways.

Counting

1	2	3	4	5
6	7	8	9	10

Area is 10 square units.

Multiplying



2 units

5 units

5 squares in 1 row.

(5 × 2) squares in 2 rows.

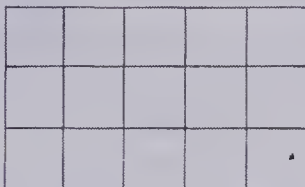
10 square units.

Area of a rectangle = length × width

$$A = l \times w$$

### Exercises

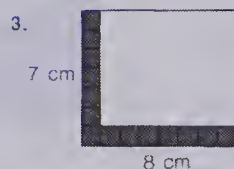
- How many squares in 1 row? 5
- How many rows? 3
- What is  $5 \times 3$ ? 15
- What is the area of the rectangle? 15 square units



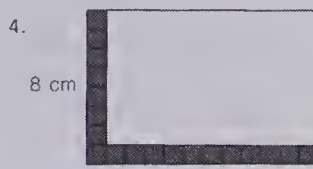
Find the area of each rectangle



Area =  $50 \text{ cm}^2$



$56 \text{ cm}^2$

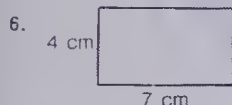


$96 \text{ cm}^2$

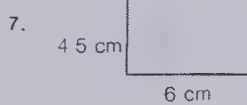
- In the formula  $A = l \times w$ , what does each letter represent?

Area = length × width

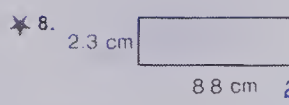
Find the area of each rectangle.



$28 \text{ cm}^2$



$27 \text{ cm}^2$



$20.24 \text{ cm}^2$

Area of a rectangle using formula 155

## OBJECTIVE

To find the area of a rectangle using a formula

## PACING

Level A 1-8

Level B 1-8

Level C 1, 2, 5-8

## MATERIALS

large demonstration cardboard rectangle, cardboard squares

## RELATED AIDS

BFA PROB. SOLVING LAB II — 122, 126.

## BACKGROUND

These exercises build towards the formal formula for calculating the area of a rectangle.

Area = number of squares in 1 row × number of rows

Area = length × width

$$A = l \times w$$

## SUGGESTIONS

**Initial Activity** Prepare a large rectangle and 1 row of squares which will fit along one edge. Then elicit the number of square units in 1 row. Place more squares along an adjacent edge. Ask how many rows there are, and eventually, how many squares there are altogether (see Exercise 2). Then elicit the generalization. If necessary, cover the whole rectangle with squares to fully establish the concept of area.

## USING THE BOOK

Discuss the pupil display emphasizing the meaning of area — the number of units of area needed to cover the space.

Then elicit that the short way to calculate the number of square units is: number of units in 1 row × number of rows.

Do Exercises 1, 2, and 5 orally. Assign Exercises 3, 4, 6, 7, and 8. Encourage students to do these by multiplying the number of centimetres in one row by the number of rows to find the total area.

## ACTIVITIES

1. Provide students with unit squares suitable for covering the teacher's desk or a table in the room. Have students arrange them as illustrated in Exercise 2 and calculate the area. Repeat for other rectangles.

2. See the "Fact Folder" idea as discussed in Activity 2, page 152, of the teaching notes. Place lengths on one set of pages and widths on the other. These booklets can be used for both area and perimeter.

## OBJECTIVES

- To draw a diagonal of a rectangle to form a right triangle
- To find area of a right triangle
- To practise multiplication of 3 factors

## PACING

- Level A 1-4, Tune Up
- Level B 1-4, Tune Up
- Level C 1, 2, 4, 5; Tune Up — optional

## VOCABULARY

diagonal

## MATERIALS

graph paper

## RELATED AIDS

HMS — DM46.  
BFA PROB. SOLVING LAB II — 122, 126.

## BACKGROUND

Multiplication of three numbers is necessary for the work on volume in the next section (page 159). Encourage good procedures in written work, i.e.,  
 $17 \times 10 \times 12 = 170 \times 12 = 2040$ .

## SUGGESTIONS

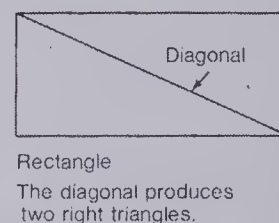
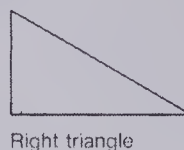
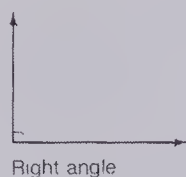
**Initial Activity** Have the students draw rectangles on graph paper and cut them out. Then have the students draw a diagonal in each, cut along the diagonal, and compare the two parts. Ask whether the two parts are congruent, that is, whether they are of the same size. Then elicit that one triangle has half the area of the rectangle.

## USING THE BOOK

Have the students work through Exercise 1 as you direct them. Encourage the students to verbalize these generalizations: (a) the diagonal divides the rectangle into two congruent triangles, (b) the area of the triangle is one half the area of the rectangle.

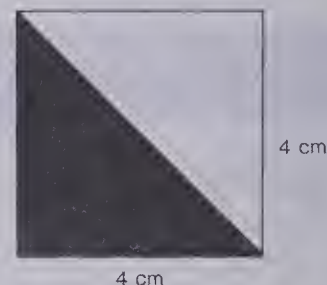
Do Exercises 2 and 3 orally. Assign Exercise 4 (and Exercise 5 where appropriate). Assign the Tune Up.

## Area of a Right Triangle



### Exercises

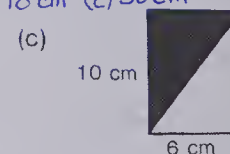
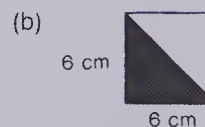
1. (a) What is the area of the square?  $16 \text{ cm}^2$   
 (b) A diagonal is drawn in the square. What new shapes are formed?  $2 \text{ triangles}$   
 (c) Trace the coloured triangle. Cut it out.  
 Is it the same size as the white triangle?  $\text{Yes}$   
 (d) Is the area of each right triangle half the area of the square?  $\text{Yes}$   
 (e) What is the area of the right triangle?  $8 \text{ cm}^2$



2. (a) What is the area of the rectangle?  $12 \text{ cm}^2$   
 (b) Is the area of the coloured triangle the same as the white triangle?  $\text{Yes}$   
 (c) Is the area of each right triangle half the area of the rectangle?  $\text{Yes}$   
 (d) What is the area of the coloured right triangle?  $6 \text{ cm}^2$

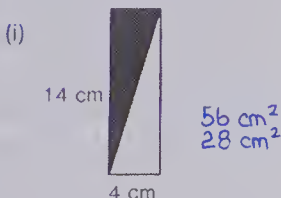
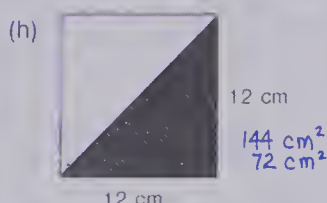
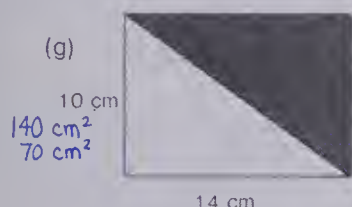
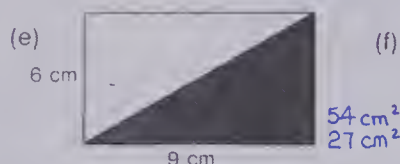
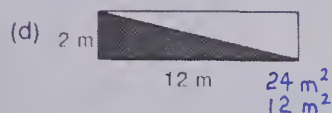
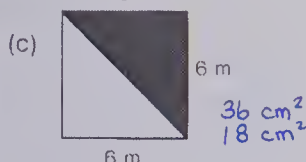
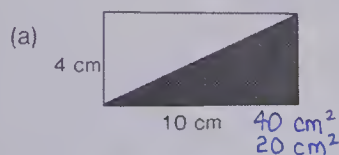


3. What is the area of each rectangle? (a)  $32 \text{ cm}^2$  (b)  $36 \text{ cm}^2$  (c)  $60 \text{ cm}^2$   
 What is the area of each coloured triangle? (a)  $16 \text{ cm}^2$  (b)  $18 \text{ cm}^2$  (c)  $30 \text{ cm}^2$

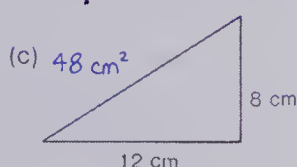
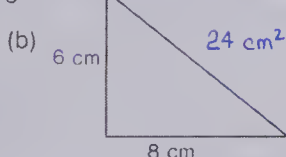
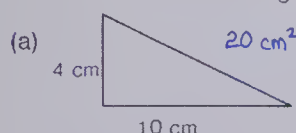




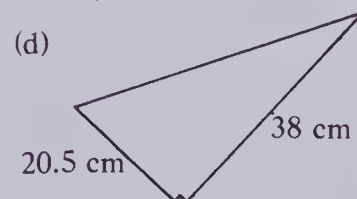
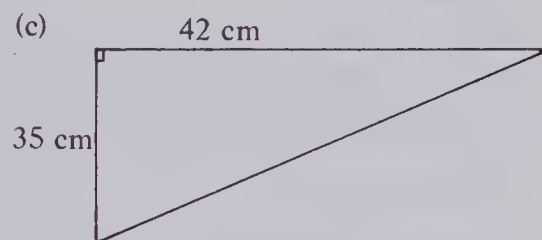
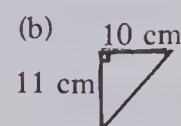
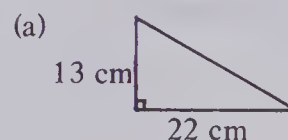
4. Find the area of each rectangle. Then find the area of each coloured triangle.



★ 5. Find the area of each right triangle.



2. (Level C) Find the area of each.



## Tune Up

Multiply.

1.  $2 \times 3 \times 4$  24

2.  $3 \times 4 \times 5$  60

3.  $2 \times 4 \times 3$  24

4.  $4 \times 5 \times 6$  120

5.  $3 \times 1 \times 2$  6

6.  $4 \times 5 \times 2$  40

7.  $5 \times 12 \times 16$  960

8.  $8 \times 22 \times 16$  2816

9.  $27 \times 13 \times 2$  702

10.  $28 \times 45 \times 12$  15 120

11.  $27 \times 30 \times 42$  34 020

12.  $44 \times 45 \times 56$  110 880

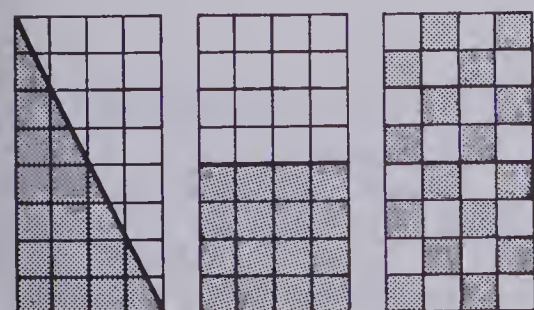
Area of right triangle, practice 157

## ACTIVITIES

1. Have a group prepare a bulletin-board display to show that the area of a triangle is half that of a related rectangle. Students may use graph paper.

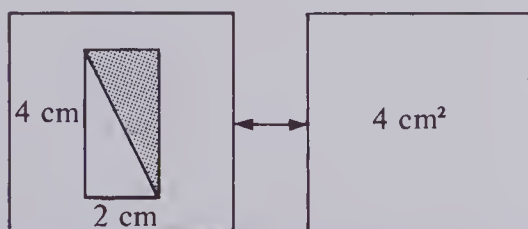
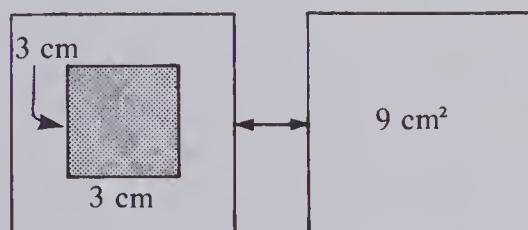
2. Provide students with various-sized rectangles cut from 1 cm grid paper (HMS — DM46). Have them show at least three ways of colouring one half of the area.

Examples



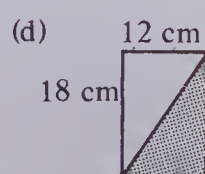
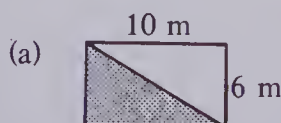
Every other square is coloured.

3. Ask the pupils to help prepare cards to play "Concentration" as described in the Activity Reservoir. Use cards such as:



## EXTRA PRACTICE

1. (Levels A and B) Find the area of each shaded region.



OBJECTIVE

To solve multi-step problems involving area

PACING

- Level A 1-7
- Level B 1-8
- Level C 1-5, 7-9

RELATED AIDS

BFA PROB. SOLVING LAB II — 122, 126.  
CALC. W/BK — 29.

SUGGESTIONS

**Initial Activity** Discuss redecorating a student's room. Why might it be necessary? Why might a student want the room redecorated? How would the room be redecorated? etc.

USING THE BOOK

Illustrate the procedures to be followed by referring to the pupil display for Wall No. 1. When you feel the students know what to do, assign Exercises 1 to 3.

Since Exercise 4 requires data from the pupil display and from Exercises 1 to 3, it is best to correct Exercises 1 to 3 before assigning Exercise 4.

Exercise 5 requires the answer from Exercise 4. Exercise 6 requires the student to realize that the room is 3 m × 4 m.

Exercise 8 requires the answer from Exercise 7.

Since Exercises 4, 5, 6, and 8 are questions with insufficient data, this is an opportunity to discuss what is needed to get an answer. These questions may be done orally in groups or discussed thoroughly if students experience difficulty.

ACTIVITIES

1. Have the students calculate the cost of redecorating their classroom. Use the newspaper or a catalogue to obtain prices. Consider the cost of materials and labour.

2. Have the students determine how much paint is needed to repaint the exterior of a building (e.g., the school).

3. Provide a challenge card such as this.

*Example*

Use the prices shown to calculate the cost of redecorating a room 2.9 m × 3.6 m with walls 2.4 m high. There is one window 2.4 m × 0.9 m and one door 1.9 m × 0.8 m. One large wall with the window is to be wallpapered. The rest is to be painted.

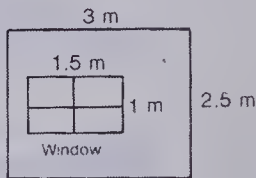
Provide suitable prices from a local price catalogue.

Redecorating Margo's Room

Margo and her dad redecorated her room.

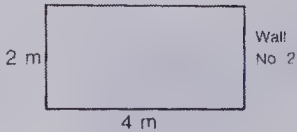
They wallpapered and painted.

Wall No. 1: Area of wall = 3 × 2.5 7.5  
Area of window = 1.5 × 1 1.5  
Area to be wallpapered 6 m<sup>2</sup>

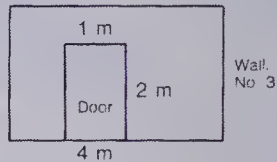


Exercises

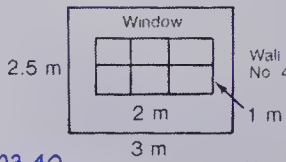
1. Wall No. 2 is 2 m high and 4 m long.  
How many square metres of wallpaper are needed for this wall? 8 m<sup>2</sup>



2. Wall No. 3 is to be painted.  
How many square metres are to be painted? 8 m<sup>2</sup>



3. Wall No. 4 is to be wallpapered.  
How many square metres of wallpaper are needed? 5.5 m<sup>2</sup>

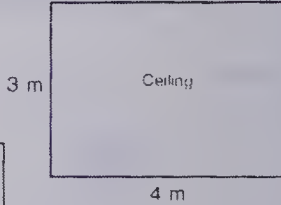


4. What is the total amount of wallpaper needed for Margo's room? 19.5 m<sup>2</sup>

5. Wallpaper costs \$1.15 for 1 m<sup>2</sup>  
What is the cost of the wallpaper? \$22.43

6. One square metre of rug costs \$16.95.  
How much will a rug cost to cover the floor? \$203.40

7. The ceiling of the room is painted white.  
How much white paint is needed? 1 L



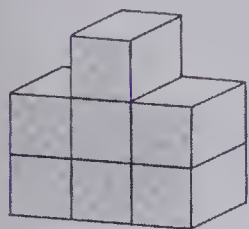
8. What is the cost of the paint for the ceiling? \$4.60

★9. What is the cost of painting Wall No. 3? \$4.60

10. The floor of the room is a rectangle.  
What is the area of the floor?

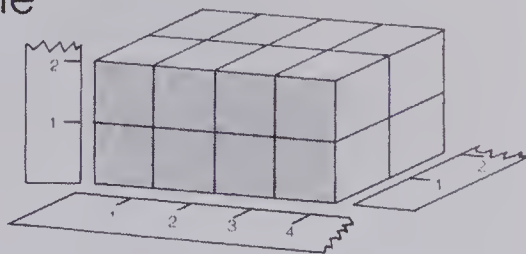
1 L of paint covers 12 m<sup>2</sup>.  
Paint costs \$4.60 for 1 L

# Volume



Volume: 7 cubic units

Volume is measured  
in  
cubic units.

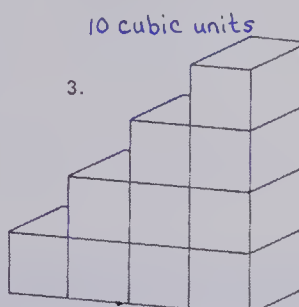
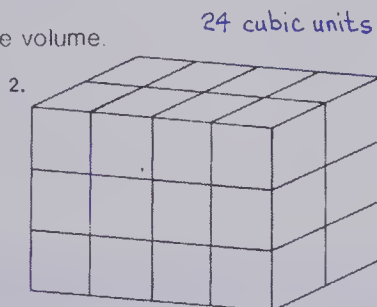
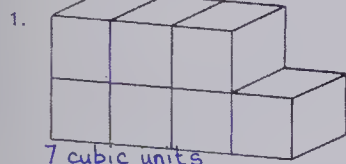


Volume: 16 cubic units

**Volume** is the measure of the space in a container.

## Exercises

Count the cubic units to find the volume.



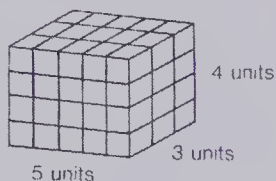
4. Find the number of cubic units in each layer. Then multiply by the number of layers to find the volume.

(a) How many cubes in 1 layer? 15

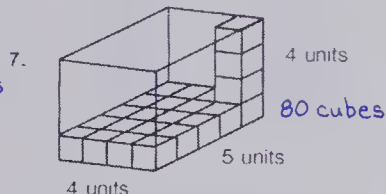
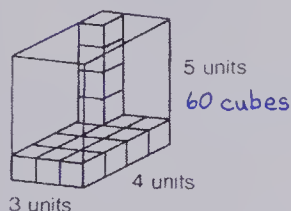
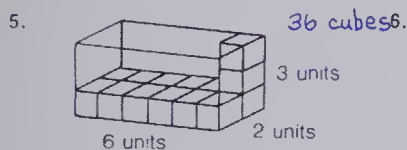
Think:  $5 \times 3$

(b) How many cubes in 4 layers? 60

Think:  $5 \times 3 \times 4$



Find the number of cubes to fill each.



Meaning of volume 159

## OBJECTIVE

To find volume by counting

## PACING

Level A All

Level B All

Level C All

## MATERIALS

a number of unit blocks

## RELATED AIDS

CALC. W/BK—29.

## SUGGESTIONS

**Initial Activity** On your desk or where students can see clearly, construct a solid using blocks as in Exercises 1 and 3. Ask a student what the volume of each is. Discuss how the answer is obtained.

Then construct a rectangular solid. Ask such questions as: "How many blocks in one layer?" "How many layers?" "How many blocks altogether?"

## USING THE BOOK

Having done the Initial Activity, the students will be prepared to do the exercises.

Watch when the students get to Exercise 5. The students might go directly to  $6 \times 2 \times 3$  not realizing what they are doing (except getting the correct answer). Emphasize that  $6 \times 2$  is the number of cubes in one layer. Multiplication by 3 is to determine the number in 3 layers.

## ACTIVITIES

1. Make up a set of flash cards to practise multiplication of three numbers. Products such as these can be done mentally.

(a)  $3 \times 4 \times 5$  (b)  $7 \times 8 \times 10$

(c)  $5 \times 2 \times 9$

Products such as these will require paper and pencil for most students.

(d)  $7 \times 8 \times 9$  (e)  $6 \times 4 \times 8$

(f)  $3 \times 7 \times 12$

2. Have the students work in pairs using blocks. Student A builds a shape

and Student B has to calculate the number of blocks in the shape without taking it apart. Students then change roles.

3. Prepare three decks of cards, each containing cards numbered from 1 to 15. Shuffle each deck and place them face down on a desk. Two to five players select one card from the top of each deck and multiply them together. The player with the greatest correct product wins the round. The first player to win three rounds wins the game.



## OBJECTIVES

To calculate the volume of a rectangular prism using a formula  
To use cubic centimetres and cubic metres

## PACING

Level A 1-15, 20-22  
Level B 1-15, 20-22  
Level C 1, 2, 6-11, 14-23

## VOCABULARY

cubic centimetre ( $\text{cm}^3$ ), cubic metre ( $\text{m}^3$ )

## MATERIALS

cubic centimetres, cubic metres

## RELATED AIDS

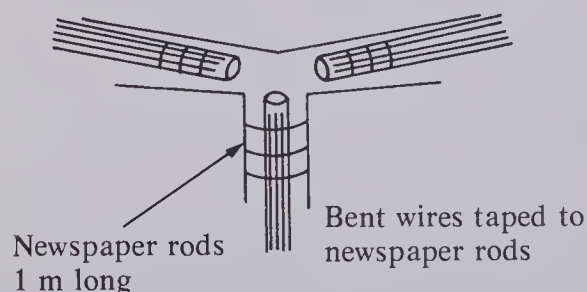
HMS — DM38 and DM39.  
BFA PROB. SOLVING LAB II — 123.

## BACKGROUND

Volume is measured in cubic units. Therefore, volume must always be recorded as a number and a cubic unit and *not* just a number. At times when the linear unit is not defined, we may just say “\_\_\_ cubic units”. If the centimetre is the linear unit, then the volume unit would be “cubic centimetres”.

## SUGGESTIONS

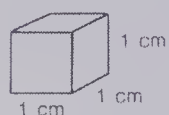
**Initial Activity** Introduce the cubic centimetre and cubic metre. Discuss the size of each. Make several rectangular prisms by stacking cubic centimetres. Emphasize the volume as developed on the previous page. Make a cubic metre skeleton model using newspapers rolled into metre-long rods and reinforced at the corners with bent wire.



## Volume of Rectangular Prisms

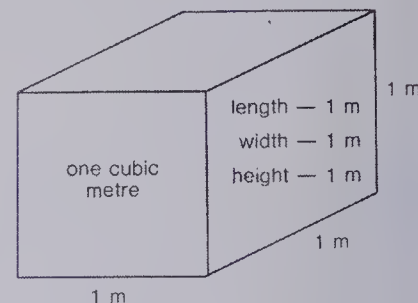
Two common units of volume are:

The cubic centimetre ( $\text{cm}^3$ )



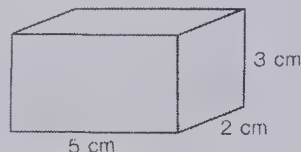
length — 1 cm  
width — 1 cm  
height — 1 cm

The cubic metre ( $\text{m}^3$ )



Scale.  
3 cm represents  
1 m.

Volume



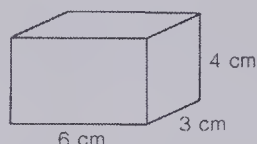
1 layer of cubic centimetres =  $5 \times 2$   
3 layers of cubic centimetres =  $5 \times 2 \times 3$   
The volume of this prism is  $30 \text{ cm}^3$ .

The **volume** of a rectangular prism is the product of the length, width, and height.

$$V = l \times w \times h$$

### Exercises

1. Find the volume of the rectangular prism.

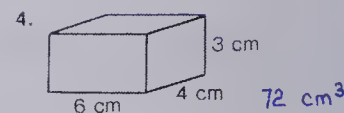
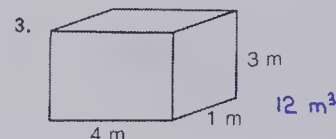
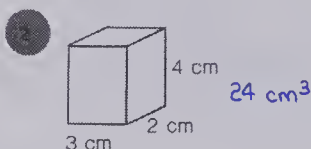


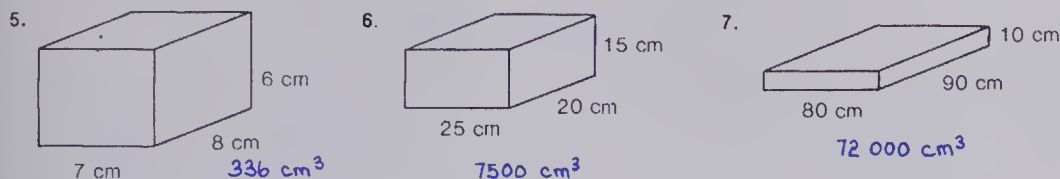
*Think* Number of cubic centimetres in 1 layer.  
Write  $6 \times 3$

*Think* Number of cubic centimetres in 4 layers.  
Write  $6 \times 3 \times 4$

Write: Volume = ■  $72 \text{ cm}^3$

Find the volume in each rectangular prism.





Find the volume of each rectangular prism.

	Length	Width	Height		Length	Width	Height
●	10 cm	3 cm	180 cm <sup>3</sup>	6 cm	9.	11 m	5 m 385 m <sup>3</sup> 7 m
10.	8 m	6 m	192 m <sup>3</sup>	4 m	11.	9 cm	4 cm 108 cm <sup>3</sup> 3 cm
12.	5 cm	5 cm	250 cm <sup>3</sup>	10 cm	13.	6 cm	1 cm 60 cm <sup>3</sup> 10 cm
14.	9 cm	4.5 cm	405 cm <sup>3</sup>	10 cm	15.	2.2 cm	4 cm 88 cm <sup>3</sup> 10 cm
★16.	35 cm	15 cm	6300 cm <sup>3</sup>	12 cm	★17.	38 cm	27 cm 19 494 cm <sup>3</sup> 19 cm
★18.	4.5 m	2.8 m	17.64 m <sup>3</sup>	1.4 m	★19.	8.5 m	4.7 m 91.885 m <sup>3</sup> 2.3 m

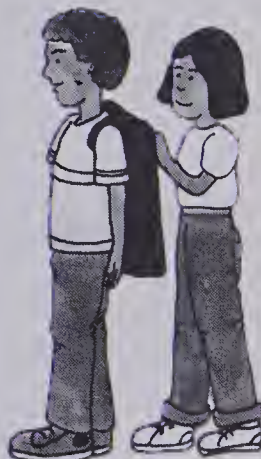
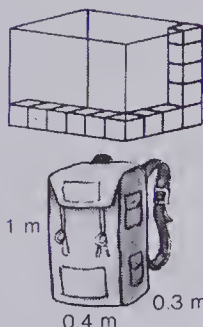
Solve these problems.

- John put cubes in a box.  
He put 6 along the length, 4 along the width, and 5 along the height.  
How many cubes can he put in the box altogether? 120

21. Martin's backpack is  
0.4 m × 0.3 m × 1 m.  
Martin has 0.25 m<sup>3</sup> of gear.  
Can he get all his gear in the pack? No

22. The box on a small truck is 1.5 m wide, 2 m long, and 1.3 m high.  
How many cubic metres does the box hold? 3.9 m<sup>3</sup>

23. A construction foreman orders 10 cm<sup>3</sup> of gravel.  
Can a truck with a box 1.4 m × 2.2 m × 3.1 m deliver it as one load? Yes



Volume of rectangular prism using formula 161

## USING THE BOOK

Review: volume = number of cubes  
in 1 layer ×  
number of layers  
number of cubes = number of cubes  
in 1 layer ×  
number of rows  
= length × width.

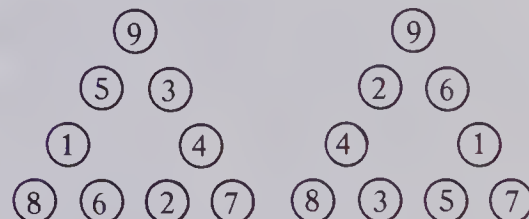
It is recommended you do not proceed directly to  $V = l \times w \times h$  with all students but that you leave this to Grade 6. Some students will realize the formula and how to use it, which is fine, but do not force this until the students are ready and understand it.

Do Exercises 1, 2, 8, and 20 orally and then assign the balance.

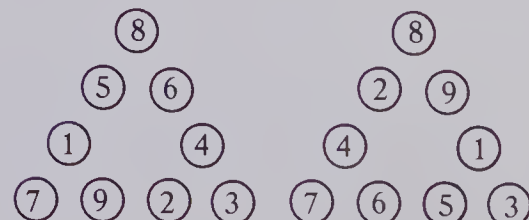
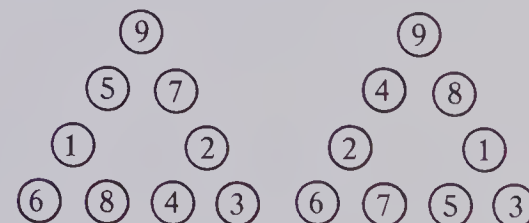
## ACTIVITIES

1. Use the digits 1 to 9 to make these magic triangles. A magic triangle is one in which the sums of the sides are equal.

(a) Make two different triangles with 24 as the sum of the vertices and 23 as the sum of the sides. (Answers are given.)



(b) Make four different triangles with 18 as the sum of the vertices and 21 as the sum of the sides. (Answers are given.)



2. See the activities listed on page 159 of the teaching notes.

3. See "Quad-Row" as described in the Activity Reservoir.

OBJECTIVE

To evaluate achievement of the chapter objectives

PACING

- Level A All
- Level B All
- Level C All

RELATED AIDS

HMS — DM40.

USING THE BOOK

Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a large number of students had difficulty with a particular topic or concept. The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 132).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Master available for use with this grade level.

Test Item	Objective	Text Page Number
1	A	136-143, 145
2	B	144, 146
3	C	153, 155, 156
4	D	159, 160
5	E	145, 158

Chapter Test

1. Divide. Some have remainders.
- (a)  $24 \overline{)168}$  7 (b)  $32 \overline{)197}$  6 R5 (c)  $28 \overline{)452}$  16 R4 (d)  $21 \overline{)567}$  27
- (e)  $45 \overline{)5895}$  131 (f)  $6 \overline{)1218}$  203 (g)  $7 \overline{)2116}$  302 R2 (h)  $36 \overline{)7425}$  206 R9

2. Show how you would check these division questions.

(a)  $52 \overline{)1352}$  26

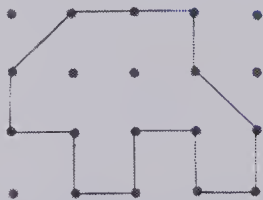
$\begin{array}{r} 26 \\ \times 52 \\ \hline 130 \\ 1352 \end{array}$

(b)  $27 \overline{)231}$  8 R15

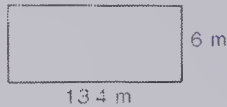
$\begin{array}{r} 8 \\ \times 27 \\ \hline 56 \\ 16 \\ \hline 216 \\ + 15R \\ \hline 231 \end{array}$

3. What is the area of

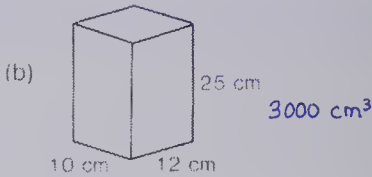
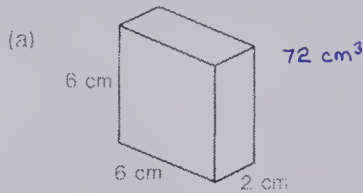
(a) this shape? 8 cm<sup>2</sup>



(b) this rectangle? 80.4 m<sup>2</sup>

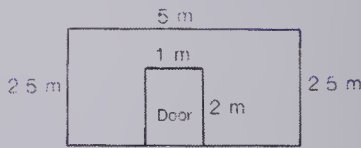


4. What is the volume?



5. Solve.

(a) This wall is to be wallpapered. How many square metres of wallpaper are needed? 10.5 m<sup>2</sup>



(b) Brent has 153 maple seedlings. He packs 24 in each crate. How many crates can he pack? 6 How many seedlings left over? 9



## Cumulative Review

1. Add.

$$\begin{array}{r} (a) \quad 314 \\ \quad 80 \\ +258 \\ \hline 652 \end{array}$$

$$\begin{array}{r} (b) \quad 280.72 \\ +364.19 \\ \hline 644.91 \end{array}$$

3. Multiply

$$\begin{array}{r} (a) \quad 83 \\ \times 24 \\ \hline 1992 \end{array}$$

$$\begin{array}{r} (b) \quad 14.9 \\ \times 0.13 \\ \hline 1.937 \end{array}$$

5. Write the value of each underlined digit.

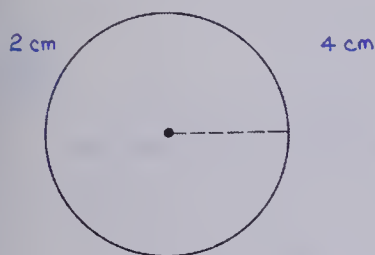
(a) 29 048    8 ones    (b) 6 521 473    6 millions    (c) 514.37    7 hundredths

6. Round to the nearest hundredth.

(a) 75.12 75.12    (b) 8 059 8.06    (c) 12.136 12.14

7. Use a ruler to find the measure of:

(a) the radius:    (b) the diameter.



2. Subtract.

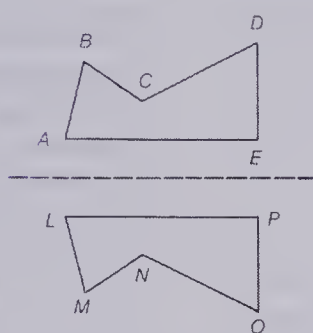
$$\begin{array}{r} (a) \quad 602 \\ -247 \\ \hline 355 \end{array}$$

$$\begin{array}{r} (b) \quad 425.03 \\ -209.76 \\ \hline 215.27 \end{array}$$

4. Divide.

$$\begin{array}{r} (a) \quad 6 \overline{)174} \quad 29 \\ (b) \quad 23 \overline{)3956} \quad 172 \end{array}$$

8. Name the matching vertices of this pair of congruent figures.



A → L  
B → M  
C → N  
D → O  
E → P

9. Choose the best measure.

(a) Paper clip    (b) Distance from A to B    (c) Pop can

(a) 0.1 t    1 g    (b) 0.5 m    50 dm    (c) 284 g    2.84 L

1 kg    10 L    5 cm    500 mm    2.84 kg    284 mL

## OBJECTIVE

To review and test selected concepts and skills previously covered

## PACING

Level A All  
Level B All  
Level C All

## USING THE BOOK

This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a large number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic or refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1(a)	7
1(b), 2(b)	12
2(a)	3
3(a)	85
3(b)	95
4(a)	105
4(b)	141
5	25
6	28
7	42
8	54
9	129

# CHAPTER 6 OVERVIEW

This chapter formalizes some of the relations that have been used in previous work. Students are to solve equations and inequations as well as to graph the solutions of each. Graphs are reviewed and developed further. The ordered pair is used to locate points on a coordinate plane.

## OBJECTIVES

- A To solve equations and inequations
- B To graph solutions of equations and inequations on number lines
- C To interpret and to draw pictographs, bar graphs, and broken line graphs
- D To make a table of values given a rule for a relation
- E To locate a point in the coordinate plane given an ordered pair
- F To name the ordered pair for a point in the coordinate plane
- G To write equations to solve word problems

## BACKGROUND

Exploring simple relations not only develops the idea of relationships among numbers, but it also reinforces computational skills. Relationships among numbers are the basis of all mathematics. Puzzles, patterns, and games all help to build these relationships.

Graphs show information and numerical facts so that these facts can be more easily grasped and under-

stood. Graphs convey messages. It is these messages we want students to grasp. Also, students are themselves to acquire the skill to convey messages in graphs. Graphing by means of ordered pairs on the coordinate plane is one way to illustrate relations among numbers.

Learning to solve problems by using equations is a step towards formalizing the students' thought processes. Care and time should be taken to develop this difficult process that is based on number relations.

## MATERIALS

whole number lines duplicated	construction paper
graph paper	atlases

## CAREER AWARENESS

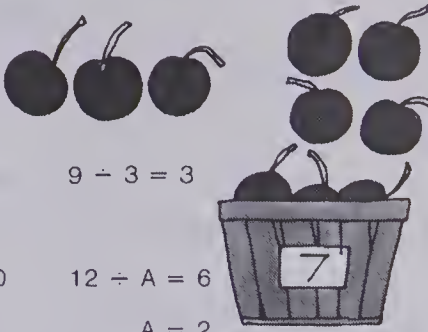
### Car Rental Manager [183]

The manager of a car rental agency must satisfy customers by providing them with cars that both suit their needs and operate properly. Hence, the manager keeps records upon which to base any new purchases for, and any sales from, the manager's fleet of cars.

There are periods of time when there are few customers and times when business is very heavy. During slack times, the manager keeps the agency records up to date and sees that the cars are cleaned and serviced. The manager also arranges to have additional staff on hand to accommodate high-demand periods.

## Equations

A number sentence with an equals sign (=) is an **equation**.



Equations:

$$3 + 4 = 7 \quad 6 - 4 = 2 \quad 2 \times 4 = 8 \quad 9 \div 3 = 3$$

Solve by finding the missing numbers in these equations.

$$3 + \blacksquare = 9 \quad 6 - \blacktriangle = 1 \quad 2 \times N = 10 \quad 12 \div A = 6$$

Solutions:  $\blacksquare = 6 \quad \blacktriangle = 5 \quad N = 5 \quad A = 2$

### Exercises

Find and write the missing number.

1.  $5 + \blacksquare = 7$

$5 + \boxed{?} = 7$

$\blacksquare = ?$

What number must be added to 5 to get 7?

The missing number is ? **2**

2.  $7 \times N = 21$

$7 \times \boxed{?} = 21$

$N = ?$  **3**

What number multiplied by 7 gives 21?

3.  $\blacksquare + 7 = 19$

$\blacksquare = ?$  **12**

What number added to 7 gives 19?

4.  $8 \div \blacktriangle = 4$

$8 \div \boxed{?} = 4$

$\blacktriangle = ?$

What number do I divide into 8 to get 4?

The missing number is ? **2**

5.  $9 - M = 4$

$9 - \boxed{?} = 4$

$M = ?$  **5**

What number subtracted from 9 gives 4?

6.  $N - 6 = 8$

$N = ?$  **14**

What number can I subtract 6 from to get 8?

Solve.

7.  $10 + \overset{4}{\blacksquare} = 14$

8.  $7 - \overset{3}{\blacksquare} = 4$

9.  $6 \times \overset{3}{\blacksquare} = 18$

10.  $10 \div \overset{2}{\blacktriangle} = 5$

11.  $12 + \overset{4}{N} = 16$

12.  $4 - \overset{4}{\blacksquare} = 0$

13.  $5 \times \overset{3}{S} = 15$

14.  $12 \div \overset{6}{\blacktriangle} = 2$

15.  $9 + \overset{1}{\blacktriangle} = 10$

16.  $8 - \overset{2}{M} = 6$

17.  $3 \times \overset{4}{\blacktriangle} = 12$

18.  $8 \div \overset{8}{B} = 1$

Solving equations 165

## OBJECTIVE

To solve equations

## PACING

Level A All

Level B All

Level C 1-4, 8, 10, 12, 14, 16

## VOCABULARY

equation

## BACKGROUND

Students have been writing number sentences for several years. Up to this time, the solutions have been through intuition with little formal procedure established. We start here to structure the thinking and to build a foundation for the formal solution steps that are to come in the next two or three years.

## SUGGESTIONS

**Initial Activity** Place several examples such as  $5 + 4 = \blacksquare$ ,  $3 \times 7 = \blacksquare$ ,  $15 \div 3 = \blacksquare$  on the chalkboard. Have the children suggest the appropriate values for each  $\blacksquare$  which make the statement true. When answers are in place, point out that (a) what now exists is an "equation", i.e., there is an equals symbol and the values on each side of the symbol are "equal" and (b) by finding the correct number for each  $\blacksquare$ , we "solve" each equation.

## USING THE BOOK

One approach to this topic is to write a number sentence on the chalkboard, then to cover up one number and ask the students what number you have covered and how they would figure it out. Then cover up another number, etc.

Next, place a number sentence on the board that has a blank in place of a number and use one of the "Think" clouds from the exercises. Do one of each kind, and then assign the exercises. As you move about the classroom giving assistance, use one of the "Think" clouds each time in order to urge the students to proceed in this manner.

You may wish to use these as examples of the four types.

(a)  $4 + S = 9$  (b)  $8 - R = 2$   
(c)  $M \times 5 = 15$  (d)  $12 \div N = 3$

## ACTIVITIES

1. Students have difficulty with these exercises if they do not know the basic facts.

Play "What's My Rule?". On an overhead projector or on the chalkboard, write a number that a student gives you (e.g., 3). (Initially, keep the numbers small—0 to 10.) You then say, "I get  $\blacksquare$ ." and write it this way.

$3 \rightarrow 7$

A second student gives you another number (e.g., 5), and you perform the same operation. Repeat "I get  $\blacksquare$ ." and write it under the first.

$3 \rightarrow 7$

$5 \rightarrow 9$

Ask "What's My Rule?" This continues until the students can give you a rule or can tell you what's happening.

2. Play the "Inequalities Game". Provide each student with a sheet with one of these patterns repeated. (Different patterns are for different ability levels.)

(a)

$\boxed{\phantom{00}} < \boxed{\phantom{00}}$

(b)

$\boxed{\phantom{00}} + \boxed{\phantom{00}} < \boxed{\phantom{00}}$

(c)

$\boxed{\phantom{00}} \times \boxed{\phantom{00}} < \boxed{\phantom{00}}$

(d)

$\boxed{\phantom{00}} + \boxed{\phantom{00}} < \boxed{\phantom{00}} + \boxed{\phantom{00}}$

(e)

$\boxed{\phantom{00}} \times \boxed{\phantom{00}} < \boxed{\phantom{00}} \times \boxed{\phantom{00}}$

Two students play by taking turns rolling a die and entering the number in one of the squares. The die is rolled until all squares are filled. If the inequality is true, score 1 point; if not, score 0. Play continues until one player scores five points.

3. Have the students help prepare missing addends, subtrahends, factors, divisors, etc. on "Poke a Hole" cards. The cards should be no wider than 4.5 cm. Use a single-hole paper punch to make holes where each missing number should be.

Answers are on the back. Students can easily locate a correct answer by poking a pencil tip through the appropriate hole.



## OBJECTIVES

- To identify number sentences as equations or inequations
- To solve inequations
- To tell whether an inequality is true or false

## PACING

- Level A 1-6, 10-15, 19, 20, 22, 23, 25, 26, 28, 29  
 Level B 4-9, 13-30  
 Level C 7-9, 16-30

## VOCABULARY

inequations, solutions

## RELATED AIDS

HMS — DM41.

## BACKGROUND

To solve inequations, we eventually want the students to solve the related equation, then choose numbers related to the solution (either greater than or less than) that will satisfy the inequation. However, at this point, it is acceptable for students either to answer intuitively or use the guess and test method.

## SUGGESTIONS

**Initial Activity** Review with the students the thinking and methodology involved in solving equations (page 165).

Present an inequation such as  $N + 7 < 10$  and stress that there is more than one whole number which, when substituted for  $N$ , makes the statement true.

Repeat using several such examples.

## USING THE BOOK

Discuss the three symbols  $<$ ,  $=$ , and  $>$ . Stress that only one is an equal sign (for equations) and the other two are used for inequations (unequal). You may wish to point out a way to remember the meanings of  $>$  and  $<$ . With  $<$  and  $>$  the arrow points to the lesser number and the open end points to the greater number.

Discuss the meaning of equations as statements of equality and of inequations as statements of inequality. Discuss such situations as: if Debbie and Brian do not have equal amounts of money, what can you say about the amounts they have? [Either Debbie has a greater amount or Debbie has a lesser amount than Brian.]

Work through the display and then do one from each type in the exercises. Assign the exercises.

## Inequations

A number sentence with one of these symbols,  $>$  or  $<$ , is an **inequation**.

Inequations:

$$N < 5$$

$$\blacktriangle + 5 < 10$$

$$12 > 7 + \blacksquare$$

To solve an inequation we must find *all* the whole numbers that make true statements.

$$N + 4 < 7$$

Solutions using whole numbers.

$>$  means  
"is greater than".  
 $<$  means  
"is less than".

$$0 + 4 < 7$$

$$1 + 4 < 7$$

$$2 + 4 < 7$$

$N = 0$  is a solution.

$N = 1$  is a solution.

$N = 2$  is a solution.

Think:

Since  $3 + 4 = 7$   
then  $N = 3$  is *not* a solution.

The solutions are 0, 1, 2.

### Exercises

Make the sentences true by using  $>$ ,  $<$ , or  $=$ .

$$\bullet 3 + 2 \bullet 7 <$$

$$\bullet 5 \times 3 \bullet 8 >$$

$$\bullet 6 - 4 \bullet 1 >$$

$$\bullet 26 \div 2 \bullet 13 =$$

$$5. 8 \times 3 \bullet 25 <$$

$$6. 36 \div 9 \bullet 4 =$$

$$7. 17 - 12 \bullet 4 >$$

$$8. 27 \div 4 \bullet 30 >$$

$$9. 5 \times 4 \bullet 25 <$$

True or false?

$$10. 8 < 7 \text{ False}$$

$$11. 12 - 6 > 7 \text{ False}$$

$$12. 16 \div 8 < 3 \text{ False}$$

$$13. 3 \times 9 > 25 \text{ True}$$

$$14. 33 < 4 \times 9 \text{ True}$$

$$15. 54 > 7 \times 6 \text{ True}$$

$$16. 12 - 3 > 4 + 5 \text{ False}$$

$$17. 15 - 5 < 2 \times 6 \text{ True}$$

$$18. 24 \div 8 > 6 \times 0 \text{ True}$$

Solve each using whole numbers. List the solutions.

$$\bullet 3 + \blacksquare < 5 \text{ 0,1}$$

$$20. 4 + N < 7 \text{ 0,1,2}$$

$$21. 2 + 3 > \blacksquare \text{ 0,1,2,3,4}$$

$$\bullet 5 - \blacksquare < 3 \text{ 3,4,5}$$

$$23. 8 - 4 > M \text{ 0,1,2,3}$$

$$24. 17 - 15 > A \text{ 0,1}$$

$$\bullet 3 \times N < 6 \text{ 0,1}$$

$$26. 2 \times 3 > \blacksquare \text{ 0,1,2,3,4,5}$$

$$27. \blacktriangle \times 5 < 6 \text{ 0,1}$$

$$\bullet 9 \div 3 < T \text{ 4,5,6,...}$$

$$29. 16 \div 4 < B \text{ 5,6,7,...}$$

$$30. 12 \div A < 3 \text{ 5,6,7,8,9,10,11,12}$$

166 Solving inequations

With less-able students, do one or two of the first type, then assign the balance. Repeat for each of the other types.

You may wish to use these as examples.

### Examples

1. Use whole numbers and solve.

$$(a) N < 4$$

$$(b) R + 3 < 6$$

$$(c) 12 > 4 \times M$$

$$(d) 24 \div 6 > T$$

2. True or false?

$$(a) 15 - 8 < 5 \times 1$$

$$(b) 20 \div 4 > 2 \times 10$$

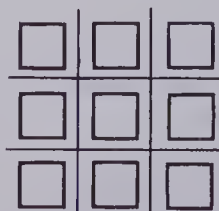
$$(c) 35 \div 7 > 27 - 22$$

## ACTIVITIES

1. This activity is designed to reinforce "less than", "equal to", and "greater than"; and at the same time, to provide drill on basic facts which are essential to these exercises. Form groups of two. Player A gives a basic fact and a relation statement such as: " $3 \times 4$  is less than  $\blacksquare$ ." Player B must give a similar fact to correctly complete the statement by saying, " $3 \times 4$  is less than  $5 \times 6$ ." Some students may do this with paper and pencil or play the game at the chalkboard. Players take turns giving the

initial basic fact involving sums, differences, products, and quotients with "less than", "equal to", or "greater than". Calculators may be provided for students to settle any differences of opinion.

2. Make a Tic Tac Toe board. On each card, write an equation or inequation (use Exercises 19 to 30 on page 166 or Exercises 7 to 18 on page 165). Place the cards face down on the playing board. The player decides which square he or she wishes to occupy and turns the card over. The player must solve the equation or inequation correctly to get one point. An additional 3 points is earned for a Tic Tac Toe.

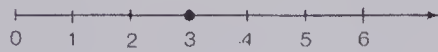


3. See "Number Sentence" as described in the Activity Reservoir.

# Number Line

We can graph whole numbers on a number line.

Example: Show the graph of  $N = 3$ .

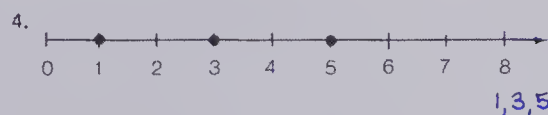
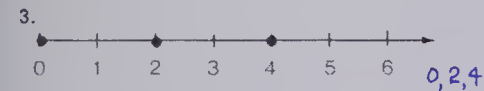
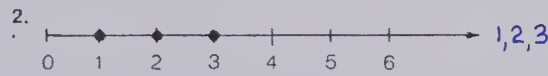
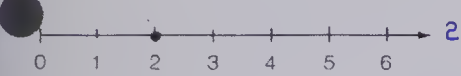


Example: Show the graph of  $N = 4, 5, 6$ .



## Exercises

Which whole numbers have been graphed.



Draw whole number lines and graph these number solutions.



Write the solutions for each.

Then graph the solutions on a whole number line.

11.  $N < 3$   $N = 0, 1, 2$  12.  $T < 5$   $T = 0, 1, 2, 3, 4$  13.  $4 > R$   $R = 0, 1, 2, 3$   
 14.  $X = 6$   $X = 6$  15.  $\blacksquare < 2$   $\blacksquare = 0, 1$  16.  $A = 3$   $A = 3$   
 17.  $1 + 5 > \blacksquare$   $\blacksquare = 0, 1, 2, 3, 4, 5$  18.  $3 \times N = 12$   $N = 4$  19.  $2 \times 3 > T$   $T = 0, 1, 2, 3, 4, 5$   
 20.  $\blacksquare < 17 - 12$   $\blacksquare = 0, 1, 2, 3, 4$  21.  $\blacksquare < 3 \times 1$   $\blacksquare = 0, 1, 2$  ★22.  $N < 9 \times 0$  No solution.

Graphing solutions on a number line 167

## OBJECTIVES

To graph numbers on the number line  
 To graph solutions of equations and inequations

## PACING

Level A All  
 Level B All  
 Level C All

## MATERIALS

duplicated page of whole number lines (the number lines need not go higher than 10)

## RELATED AIDS

HMS — DM42.

## BACKGROUND

The graph of a number is a point. For example, the graph of  $N = 2$  is the corresponding point on the number line identified by 2. The number 2 is the coordinate of the point. The point whose coordinate is zero (0) is called the *origin*. The solution of an equation or inequation can be graphed; that is, the solution or solution set can be graphed.

## SUGGESTIONS

**Initial Activity** Quickly review the solution procedure for equations and inequations as presented over the last two pages. Discuss the method in which the solutions can be graphed on a number line as presented in the display at the top of the pupil page.

## USING THE BOOK

The pupil display illustrates the graphing of a single number and of a set of three numbers. Exercises 1 to 4 are used to illustrate how numbers are graphed. Exercises 5 to 10 require the student to graph given numbers (HMS — DM42). Exercises 11 to 22 require the student to identify the solutions (the numbers which make each statement true) and then to graph or mark these points on a number line.

Before assigning Exercises 11 to 22, emphasize that we are working with whole numbers only. Also be certain the students realize they are to graph the numbers which make the equation or inequation a *true* statement.

You might indicate that Level A students only do equations, i.e., Exercises 14, 16, and 18.

## ACTIVITIES

1. You might have the students play "Omega-Y" as described in the Activity Reservoir.

2. Have the students write the numbers zero to ten in words. Then ask them to fit as many as they can into a crossword puzzle. A partially completed puzzle is shown.

- (a) For each number named, make up an addition, subtraction, multiplication, or division problem which has the number name as an answer.  
 (b) Ask a classmate to do your crossword puzzle (the puzzles are exchanged without answers).

	a				
	z				
	b	i	g	h	c
	e				t
	r				e
d	f	o	u	r	n

## OBJECTIVES

To graph solutions of equations and inequations

To match the solution of an equation or inequation with its graph

## PACING

Level A 1-21

Level B 1-27

Level C All

## MATERIALS

duplicated page of whole number lines to 10

## RELATED AIDS

HMS — DM43.

## USING THE BOOK

In presenting the material in the pupil display, emphasize that the student should first *solve* the equation or inequation. Only then should the student graph the solution.

The exercises are broken into equations (Exercises 1 to 4 and 10 to 18) and inequations (Exercises 5 to 9 and 19 to 30). You may wish to do all the equation exercises before assigning the inequation exercises.

Some Level A students may be exempted from Exercises 19 to 30 altogether.

You may wish to do Exercises 1 to 18 orally with the graphing done individually.

Be certain to demonstrate how you wish answers to be written in exercise books.

## ACTIVITIES

1. Make up two sets of cards: one a set of computations and the other a set of relation cards.

Computation Cards

$2 + 4$	$6 - 5$	$7 \times 4$	$32 - 5$
$28 \div 4$	$13 - 6$	$0 + 7$	$15 \div 3$

Relation Cards

$>$	$=$	$<$
-----	-----	-----

The computation cards are stacked face down. The relation cards are face up. Each player draws two computation cards, places them face up on the table, and then selects the correct relation card to place between the first two cards.

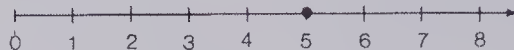
## Graphing Solutions

We can graph solutions of

equations.

$$3 \times N = 15$$

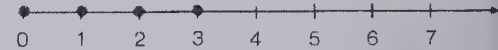
Solution:  $N = 5$



inequations.

$$12 - N > 8$$

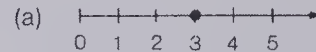
Solution:  $N = 0, 1, 2, 3$



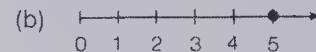
### Exercises

Match the solutions with their graphs.

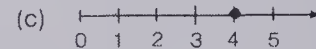
1.  $X = 3$  (a)



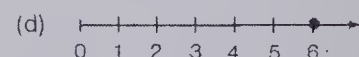
2.  $N + 3 = 8$  (b)



3.  $4 \times \blacksquare = 24$  (d)



4.  $36 \div \blacksquare = 9$  (c)



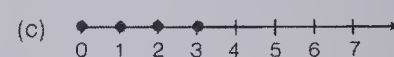
5.  $8 > \blacksquare$  (d)



6.  $N + 3 < 7$  (c)



7.  $N < 6 \times 1$  (b)



8.  $56 \div 8 > T$  (a)



9.  $A < 8 - 3$  (e)





Solve each equation.

Graph the solution on a whole number line.

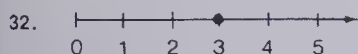
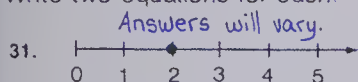
10.  $N + 5 = 8$   $N=3$       11.  $T - 9 = 4$   $T=13$       12.  $\blacksquare \times 3 = 12$   $\blacksquare=14$   
 13.  $12 \div 6 = A$   $A=2$       14.  $16 - A = 15$   $A=1$       15.  $\blacksquare - 6 = 7$   $\blacksquare=13$   
 16.  $8 - \blacktriangle = 8$   $\blacktriangle=1$       17.  $19 - 15 = N$   $N=4$       18.  $5 \times N = 25$   $N=5$

Solve each inequality.

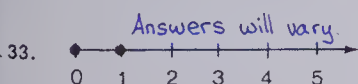
Graph the solutions of each inequality on a whole number line.

19.  $N + 4 < 8$   $N=0,1,2,3$       20.  $12 > N + 7$   $N=0,1,2,3,4$       21.  $6 \times N < 24$   $N=0,1,2,3$   
 22.  $5 \times G < 20$   $G=0,1,2,3$       23.  $40 > 10 \times \blacksquare$   $\blacksquare=0,1,2,3$       24.  $16 - N > 12$   $N=0,1,2,3$   
 25.  $18 - A > 14$   $A=0,1,2,3$       26.  $26 - A > 20$   $A=0,1,2,3,4,5$       27.  $10 < 30 \div N$   $N=1,2$   
 28.  $3 \times N < 17$   $N=0,1,2,3,4,5$   
 29.  $20 < 46 \div N$   $N=1,2$   
 30.  $33 > 10 \times A$   $A=0,1,2,3$

Write two equations for each.



Write two inequalities for each.



## BRAINTICKLER

1. Explain why  $\blacktriangle$  must be either 5 or 6.

$$\begin{array}{r} \blacksquare 7 \blacksquare \\ + \blacksquare 8 \blacksquare \\ \hline \blacksquare \blacktriangle \blacksquare \end{array}$$

2. Explain why  $\blacktriangle$  must be either 7 or 8.

$$\begin{array}{r} \blacksquare 6 \blacksquare \\ - \blacksquare 8 \blacksquare \\ \hline \blacksquare \blacktriangle \blacksquare \end{array}$$

Graphing solutions on a number line 169

The players check each other.

Players keep the computation cards if the number sentence is correct and replace them in the deck if the number sentence is false. Relation cards are always returned to the table. The player with the most cards at the end of the game is the winner.

2. Challenge the students with a problem such as: "Why can the first number in the sum *not* be 0, 1, or 2?"

$$\begin{array}{r} \blacksquare 7 \blacksquare \\ + \blacksquare 8 \blacksquare \\ \hline \blacksquare \blacksquare \blacksquare \end{array}$$

[Since it is the sum of two numbers greater than 0 and a hundred must be regrouped, the least it can be is 3.]

3. Challenge the students with a problem such as: "Why can the first number in the difference *not* be 9 or 8?"

$$\begin{array}{r} \blacksquare 6 \blacksquare \\ - \blacksquare 8 \blacksquare \\ \hline \blacksquare \blacksquare \blacksquare \end{array}$$

[Since we had to regroup 1 hundred, the most we can have is 8 hundred left. And the least we can subtract is 1 hundred; hence, it must be 7 hundred or less.]

## EXTRA PRACTICE

Solve each. Graph the solution on a whole number line.

1.  $N + 2 = 8$       2.  $5 \times M = 45$   
 3.  $24 \div N = 4$       4.  $72 \div N = 8$   
 5.  $N - 3 = 4$       6.  $28 \div Q = 4$   
 7.  $20 = 40 \div T$       8.  $50 = T \times 5$   
 9.  $100 = 10 \times R$       10.  $120 = 10 \times S$   
 11.  $3 \times N < 21$       12.  $4 + N < 8$   
 13.  $15 > 5 \times T$       14.  $20 > T \times 6$   
 15.  $2 \times T < 10$       16.  $14 \div T < 2$   
 17.  $16 - N = 8$       18.  $4 + T < 14$   
 19.  $8 < 1 + P$       20.  $8 > 1 + P$

## OBJECTIVES

To write an equation to match a word problem

To solve word problems using equations

## PACING

Level A 1-8

Level B 1-8

Level C All

## BACKGROUND

It is very helpful when solving problems to write a number sentence (equation) that fits the problem. We can then solve the problem by solving the equation.

## SUGGESTIONS

**Initial Activity** Before turning to the text, you may wish to briefly review (a) equations, (b) solving equations, (c) your problem-solving technique (and/or Professor Q's four questions).

## USING THE BOOK

Discuss thoroughly the pupil display on page 170. Emphasize the four steps. Have a student read the problem and work through the four steps.

Emphasize that some students may have different equations. For example, a student may write  $12 + N = 15$  for the problem in the display. Therefore, it is important to stress to the students that if their equations are not the same as the answer given, they should ask the teacher to check it individually. However, the solutions *must* be the same — the method *may not be*.

Work Exercises 1 and 2 with the groups and go through the steps outlined in the display. The six parts of Exercise 1 focus on the latter steps.

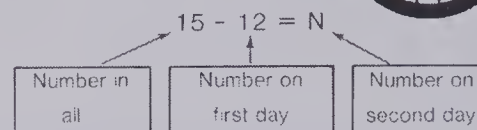
## Solving Problems Using Equations

Mr. Herb sold 15 bicycles in two days.  
He sold 12 on the first day.  
How many did he sell on the second day?

Step 1. Answer Professor Q's four questions.



Step 2. Write a number sentence that fits the problem.

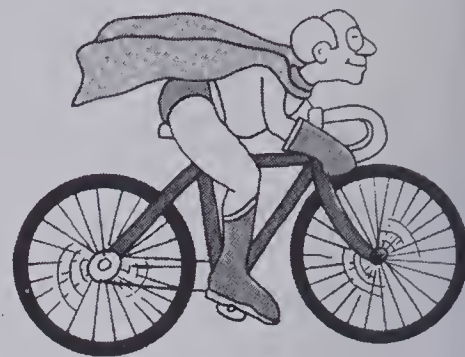


Step 3. Solve.

$$15 - 12 = N$$
$$3 = N$$

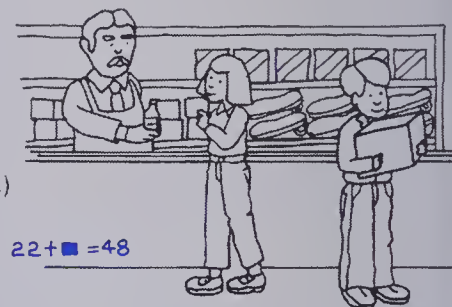
Step 4. Write a statement that answers the problem.

He sold 3 bicycles on the second day.



### Exercises

1. Mr. Herb served 48 customers in two days.  
The first day he served 22 customers.  
How many did he serve on the second day?
  - (a) How many customers the first day? **22**
  - (b) How many customers the second day? (Use ■.)
  - (c) How many customers altogether?
  - (d) Write a number sentence that fits the problem.  **$22 + \blacksquare = 48$**
  - (e) Solve.  **$22 + 26 = 48$**
  - (f) Write a statement. **He served 26 customers on the second day.**



2. Mr. Herb sold 16 bicycle seats in one day.

He sold 8 before lunch.

How many did he sell after lunch? **8**

(a) Write a number sentence that fits the problem.

(b) Solve.

(c) Write a statement.

3. Mr. Herb sold 8 bicycle carriers.

Ms. Exner sold 3 fewer than Mr. Herb.

How many did Ms. Exner sell? **5**

4. Ms. Exner sold three times as many bicycle lights than Mr. Herb did.

Mr. Herb sold 9 lights.

How many did Ms. Exner sell? **27**

5. There were 36 sets of pedals on the shelf in the morning.

Mr. Herb and Ms. Exner sold a number of sets.

When the shop closed there were only 16 on the shelf.

How many sets of pedals did they sell? **20**

6. Mr. Herb needs to order 24 chains.

There are 4 chains to a box.

How many boxes should he order? **6**

7. Ms. Exner received an order for 48 kickstands.

She has 16 on the shelf.

How many more does she need? **32**

8. Mr. Herb sells three times as many 10-speed bicycles as 5-speed bicycles.

The number of 5-speed bicycles he sold was 15.

How many 10-speed bicycles did he sell? **45**

- ★ 9. Ms. Exner received an order for 9 Cougar XM bicycles.

She knew she had fewer than 4 Cougar XM bicycles.

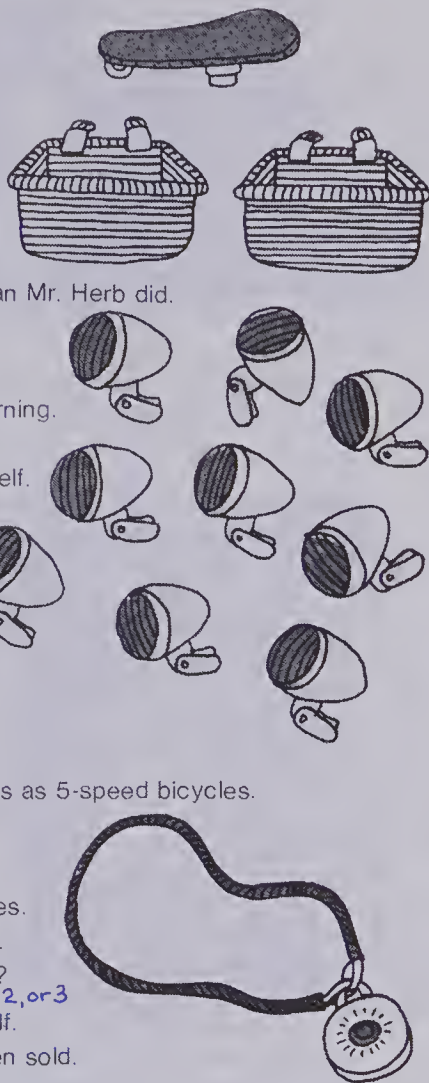
What number of Cougar XM bicycles might she have?

**0, 1, 2, or 3**

- ★ 10. In the morning there were 12 lock chains on the shelf.

Mr. Herb remembers selling 6. More might have been sold.

How many lock chains could be on the shelf? **0, 1, 2, 3, 4, 5, or 6**



Solving problems using equations 171

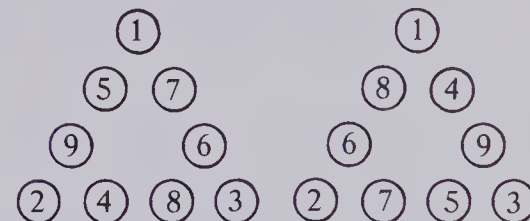
## ACTIVITIES

1. Provide the student with a picture (or have the student bring a picture reminding him or her of a math problem). The student, then, makes up a word problem for the others in the class based on the picture. The student is to write out a complete solution so the others can check their own work. The picture and problems can be glued to a piece of cardboard and hung in the "Problems" corner of the bulletin board for use at any time. The solutions, properly labelled, can be hung near by. Each student can be challenged to make up problems using each of the four operations. (This exercise helps students understand problems and how to solve them.)

If more structure is required, see the teaching notes on pages 4, 26, and 90-91.

2. Have the students play "Number Sentence" as described in the Activity Reservoir. The students may use all four operations.

3. Use the digits 1 to 9 to make these magic triangles. The sum of the vertices is 6, and the sum of a side is 17. (Answers are given.)





## OBJECTIVES

To write an equation and solve it  
To solve problems

## PACING

Level A 1-11  
Level B All  
Level C All

## VOCABULARY

Porcupine Trail

## RELATED AIDS

HMS — DM44.

## USING THE BOOK

Use the pupil display and the procedure indicated. If there are no difficulties, move directly to the exercises.

You may have students work at the chalkboard to do the questions. This affords you the opportunity to observe many students at one time. Alternately, you may work with small groups, especially with those students with reading problems.

Point out that in some questions (Exercises 2 and 4) the students must refer to an earlier question.

## Using Equations

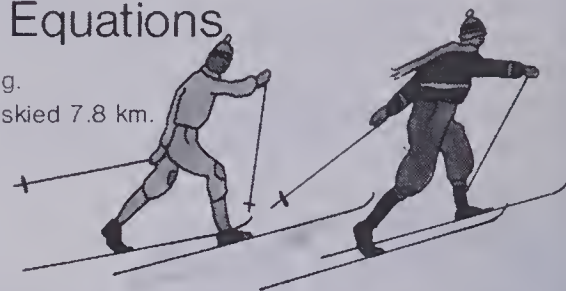
Melvin and Gordon went cross-country skiing.  
They skied 6.3 km before lunch. Then they skied 7.8 km.  
How far did they ski altogether?

Answer Professor Q's questions.

Write an equation:  $6.3 + 7.8 = N$

Solve:  $14.1 = N$

Write a statement: They skied 14.1 km altogether.



### Exercises

- Melvin carried a pack with a mass of 5.8 kg.  
Gordon's pack was 6.4 kg.  
How many kilograms were the two packs together?  
Write an equation:  $\blacksquare + \blacktriangle = N$   
Solve the equation:  $12.2 \blacktriangledown = N$   
Write a statement: *The two packs were 12.2 kg together.*
- Refer to Exercise 1.  
How many more kilograms was Gordon's pack than Melvin's?  
Write an equation:  $\blacksquare - \blacktriangle = N$   
Solve the equation:  $0.6 \blacktriangledown = N$   
Write a sentence: *Gordon's pack was 0.6 kg more than Melvin's.*
- Clara carried a pack with a mass of 6.3 kg.  
Jenny's pack was 5.5 kg.  
How many kilograms were the two packs together? *11.8 kg*
- Refer to Exercise 3.  
How many more kilograms was Clara's pack than Jenny's? *0.8 kg*
- Gordon's skis were 150 cm long.  
Melvin's skis are 15 cm longer.  
How long are Melvin's skis? *165 cm*



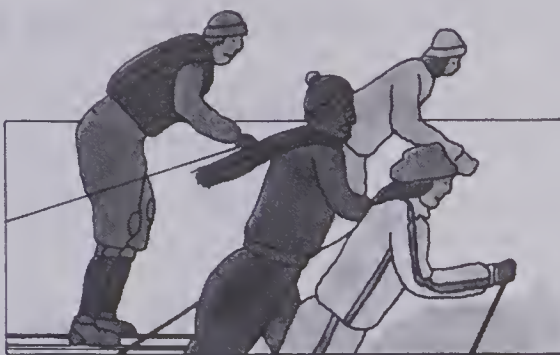
6. Clara's skis were 135 cm long.  
Jenny's skis are 35 cm longer.  
How long are Jenny's skis? **170 cm**

7. Gary skied 3 times as far as Fred.  
Fred skied 3.1 km.  
How far did Gary ski?

Write an equation:  $\blacksquare \times \blacktriangle = N$

Solve:  $9.3 \blacktriangledown = N$

Write a statement: **Gary skied 9.3 km.**



8. Fred skied the Porcupine Trail 4 times in a week.  
The trail was 4.6 km long.  
How many kilometres did Fred ski in the week? **18.4 km**

9. Gary skied the Eagle Trail five times in a week.  
The trail was 5.7 km long.  
How many kilometres did Gary ski in the week? **28.5 km**

10. Irene skied the Moose Mountain Trail in 1.5 h.  
Nancy skied the trail in 2.7 h.  
How much more time did Nancy take than Irene? **1.2 h**

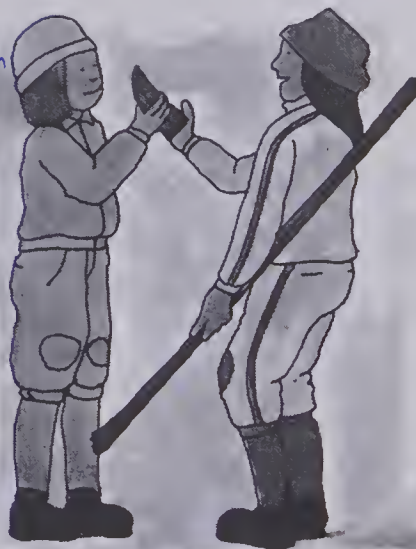
11. Melvin skied the Spray River Trail in 2.8 h.  
Gordon skied the trail in 3.3 h.  
How much more time did Gordon take than Melvin? **0.5 h**

12. Irene, Mary, and Clara share in buying a repair ski tip.  
A tip cost \$7.14.  
How much is each person's share?

Write an equation:  $\blacksquare \div \blacktriangle = N$

Solve:  $2.38 \blacktriangledown = N$

Write a statement: **Each person's share is \$2.38.**

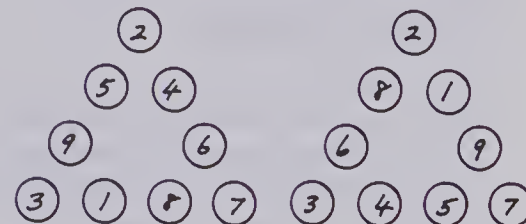
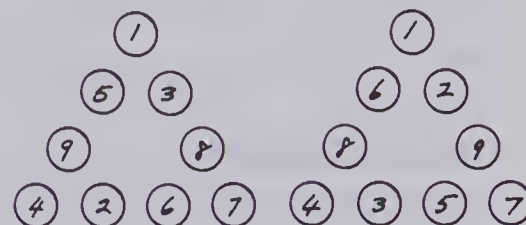


- ★13. Irene and Clara decided to break a 13.6 km ski trip into 4 equal parts.  
How many kilometres in each part? **3.4 km**

Solving problems using equations 173

## ACTIVITIES

1. Use the digits 1 to 9 to make these magic triangles. The sum of the vertices is 12 and the sum of a side is 19. (Answers are given.)



2. Prepare assignment cards similar to the following.

234	541	59	602	749
(a) Choose a number from the top of this card.				
(b) Choose a number from the bottom of this card.				
(c) Multiply the numbers.				
(d) Use a calculator to check your answer.				
(e) Choose other numbers in the same way and practise multiplication.				
23	51	8	2.5	47

3. See the "Poke a Hole" idea on page 165, Activity 3, of the teaching notes.

## EXTRA PRACTICE

- When I add 15 to a number, the sum is 22. What is the number? [7]
- I subtract 17 from a number and the answer is 28. What is the number from which I subtracted 17? [45]
- If I take 48 from a number, the answer is 29. What was the number I started with? [77]
- What number must I take from 97 to give an answer of 49? [48]
- A number is the difference between 31 and 4. What is the number? [27]
- ★6. Janet's ski poles are 95 cm long. Her instructor says her poles are 15 cm too long. How long should they be? [80 cm]
- ★7. Gary skied 3.5 km. Suzette skied four times farther. How far did Suzette ski? [14 km]

## OBJECTIVE

To use equations to solve problems involving large numbers

## PACING

Level A 1-8

Level B 1-10

Level C All

## VOCABULARY

Venus, Mercury, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto

## BACKGROUND

Some students may be able to write an addition or subtraction equation for a problem which involves relatively small numbers but unable to write equations for similar problems involving large numbers.

## SUGGESTIONS

**Initial Activity** Ensure that the students understand the situations involved. You might do this by assigning students to represent Mars, Earth, and the Sun. Earth and Mars are each attached to the Sun by strings about 2 m and 3 m long, respectively. First, they are on opposite sides of the Sun, then both on one side. In each case, ask how far apart they are. In the first case, they add; in the second, they subtract.

## USING THE BOOK

Discuss the chart. Have the students read aloud the distance each planet is from the Sun. If necessary, review how to use large numbers.

Emphasize the steps the students are to follow, especially the equation and the statement steps. After reviewing Exercise 1, assign Exercises 2 to 5. Then discuss Exercise 6 and assign the balance.

## The Planets

Planet	Distance From Sun in Kilometres
Mercury	58 000 000
Venus	107 000 000
Earth	150 000 000
Mars	227 000 000
Jupiter	774 000 000
Saturn	1 419 000 000
Uranus	2 854 000 000
Neptune	4 472 000 000
Pluto	5 880 000 000

### Exercises

Write an equation to solve each problem.

1. How much farther is Saturn from the sun than Earth?

Write an equation:  $1\,419\,000\,000 - 150\,000\,000 = \triangle$

Solve:  $1\,269\,000\,000 \nabla = \triangle$

Write a statement: Saturn is 1 269 000 000 km farther from the sun than Earth.

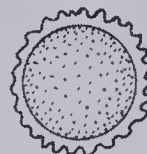
2. How much farther is Venus from the sun than Mercury? 49 000 000 km

3. When Venus and Earth are on the opposite sides of the sun, how far apart are the two planets? 257 000 000 km

Venus



Sun



Earth

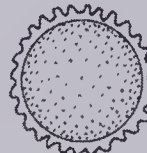


4. When Jupiter and Mars are on the opposite sides of the sun, how far apart are the two planets? 1 001 000 km

Jupiter



Sun



Mars





5. When Pluto and Neptune are on the opposite sides of the sun, how far apart are the two planets? **10 352 000 000 km**

6. When Venus and Mercury are on the same side of the sun, how far apart are the two planets? **49 000 000 km**



7. When Jupiter and Earth are on the same side of the sun, how far apart are the two planets? **624 000 000 km**



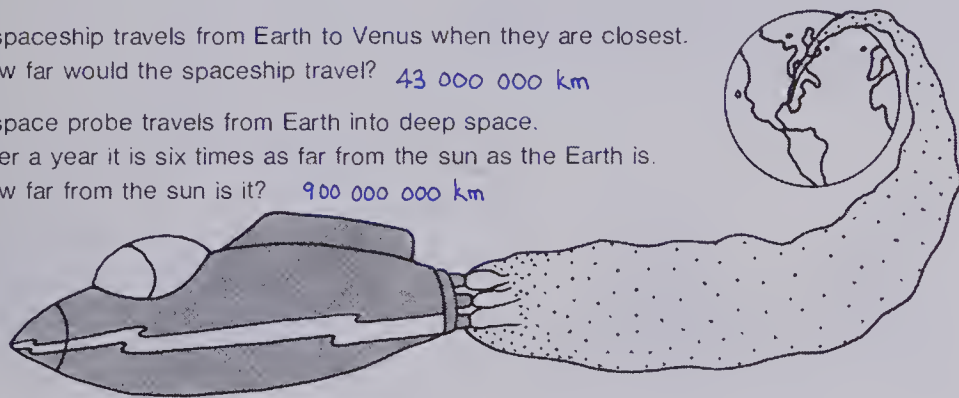
8. When Pluto and Uranus are on the same side of the sun, how far apart are the two planets? **3 026 000 000 km**



9. When Earth and Mars are closest, how many kilometres must a spaceship travel to go from Earth to Mars? **77 000 000 km**

10. A spaceship travels from Earth to Venus when they are closest. How far would the spaceship travel? **43 000 000 km**

- ★ 11. A space probe travels from Earth into deep space. After a year it is six times as far from the sun as the Earth is. How far from the sun is it? **900 000 000 km**



## ACTIVITIES

1. Ask students to prepare a picture or pictorial story on some aspect of future space travel.

2. See "The P.V. Game" as described in the Activity Reservoir.

## EXTRA PRACTICE

1. Have the students repeat Exercise 3 for Earth and each of the other planets in turn.

2. Have students repeat Exercise 6 for Earth and each of the other planets in turn.

## OBJECTIVES

To interpret a pictograph  
To draw a pictograph

## PACING

Level A 1-7  
Level B All  
Level C All

## VOCABULARY

province, average, household

## RELATED AIDS

CALC. W/BK — 42.

## BACKGROUND


A graph displays information in a form in which relationships are more easily discovered than when the data are in chart or paragraph form. However, the data can be more accurately presented in a table. For example, the pictograph on page 176 merely tells us which province has the most (or least) people per doctor, which provinces are above or below the Canadian average, etc. From the pictograph, we would estimate that there are about 550 people per doctor in Ontario; whereas in a table form, the more accurate figure of 542.5 could be recorded.



## SUGGESTIONS

**Initial Activity** Bring a pictograph to class from a magazine or newspaper. Discuss the graph using questions similar to those in the Using the Book section on this page.

## USING THE BOOK

Refer to the pictograph on page 176 of the student book. Ask:

- What is the graph about?
- Which provinces are listed?
- What does the complete symbol  represent?

- What do the partial symbols  and  represent?







































- What do you think "Average for Canada" means?


Then deal with Exercises 1 to 5.

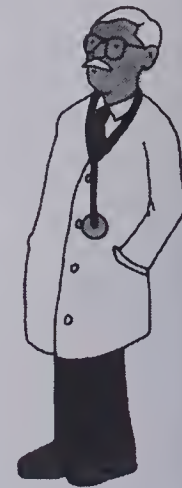
Before assigning Exercise 6, review the steps in making a graph.

- What is the graph to tell?
- What places or objects are to be named?
- What symbol will you use?  
(Remember, it has to be easy to draw or cut out.)
- What will the symbol represent?
- How many or much will each symbol represent?

## Pictographs

Province	Number of People Per Doctor
Alberta	       
Newfoundland	       
Nova Scotia	     
Manitoba	    
Ontario	     
Average for Canada	    

 represents 100 people.

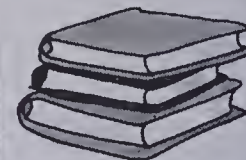































- Which province has the least number of people per doctor? *Ontario*
- Which province has the greatest number of people per doctor? *Alberta*
- How many people per doctor in Newfoundland? *750* Ontario? *550*
- What is the average number of people per doctor in Canada? *600*
- Which provinces are above the Canadian average? *Alberta and Newfoundland*
- Draw a pictograph to show the number of air passengers between certain cities.


Montreal	— Toronto	80 000
Calgary	— Edmonton	30 000
Calgary	— Toronto	10 000
Vancouver	— Toronto	20 000
Ottawa	— Toronto	45 000

### Activity

Open a library book.  
Choose 10 lines of print.  
Count the number of times each vowel is used.  
Make a comparison using a pictograph.

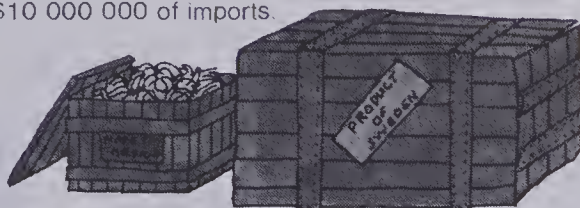


Province	Number of Households with Colour Television Sets
Quebec	        
Ontario	            
Saskatchewan	 
British Columbia	    

 represents 100 000 sets.

8. Which province has the highest number of households with colour television? the lowest number? *Ontario* *Saskatchewan*
9. How many households in Quebec have colour television? in Saskatchewan? in British Columbia? *875 000* *150 000* *425 000*
10. How many more households in Ontario have colour television sets than in British Columbia? *975 000*
11. Canadian imports in millions of dollars from certain countries are shown. Draw the pictograph. Use a symbol to represent \$10 000 000 of imports.

Switzerland	\$ 80
South Korea	15
Mexico	45
Netherlands	85
Sweden	110



12. The approximate number of students in Grade 5 in certain parts of Canada is given in the table. Show the data in a pictograph. *Hint:* Round to the nearest multiple of five hundred first. Use a symbol to represent 1000 students.

Prince Edward Island	2 560	<i>2 500</i>
Nova Scotia	16 130	<i>16 000</i>
New Brunswick	15 580	<i>15 500</i>
Northwest Territories	1 600	<i>1 500</i>
Newfoundland	15 100	<i>15 000</i>



Drawing pictographs. 1. 10 000 000 177

- (f) How many symbols will you use for each place or object named in (b)?
- (g) Draw the pictograph, colour, and label it.

You may wish to read through all of the exercises together for the benefit of those who have reading difficulties.

## ACTIVITIES

1. Ask the students to find examples of pictographs in newspapers and/or magazines. The student who brought in the graph might explain what it tells the reader.

2. Ask the students to collect some relevant data suitable for representation in pictographs. The students are then to make the pictographs.

3. Direct students to a current *Canada Yearbook*. Ask them to make a pictograph of the values of six major imports.



## OBJECTIVES

To interpret bar graphs  
To draw bar graphs

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

HMS — DM46.

## BACKGROUND

In a bar graph, the length of the bar represents the number. The scale is shown along one axis.

## SUGGESTIONS

**Initial Activity** Collect some topical bar graphs for discussion with the class. Ask what each graph tells the reader.

## USING THE BOOK

Ask the students to look at the displays on these two pupil pages. For each graph, ask: is it a horizontal or vertical bar graph? Could the data be shown by means of a pictograph? Which do you think is better; a pictograph or a bar graph for this data?

Before assigning the graph in Exercise 5 on page 178, ask questions such as: can we show 4242 km on the scale accurately or do we need to round that figure? Let's round to the nearest 10. What do you get? Can we show 4240 km? Let's round to the nearest hundred. What do you get? Can we show 4200 km? [We can. But we may wish to show 4240 by drawing it approximately halfway between 4200 and 4300.]

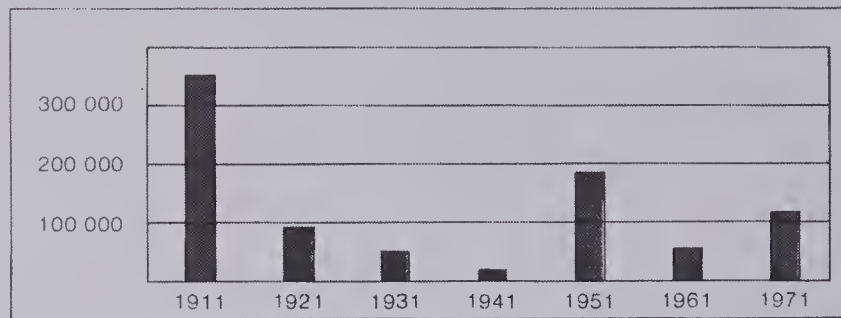
What scale shall we mark our graph in? [100's will require 43 lines, so perhaps 200's with 22 lines would be acceptable; or perhaps 500's and 9 lines would be better, depending on how big you wish to make your graph.]

Discuss these things with your students. Perhaps some students will use 100's, others 200's, and others 500's or 1000's. Discuss the merits of each.

## Bar Graphs

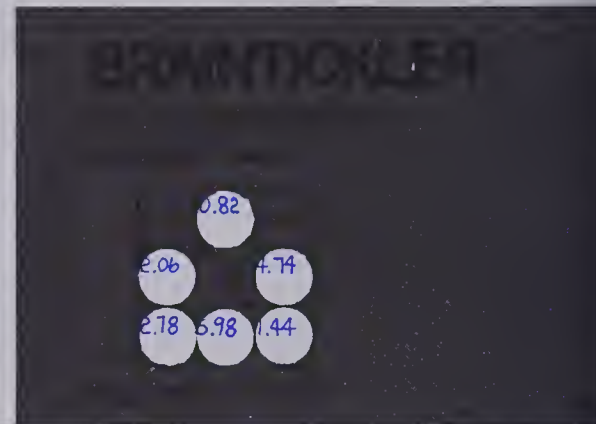
A bar graph provides a message quickly and presents data for comparisons.

Canadian Immigration, 1911 to 1971



1. In which of the years shown did the greatest number of people come to Canada? *1911*
2. In which of the years shown did the least number of people come to Canada? *1941*
3. In which year did about twice as many people come to Canada as did in 1921? *1951*
4. In 1911 there were about how many times as many immigrants to Canada as in 1971? *3 times*
5. Construct and label a bar graph:  
"Lengths of some rivers in Canada."  
Round each length to the nearest 50 km.

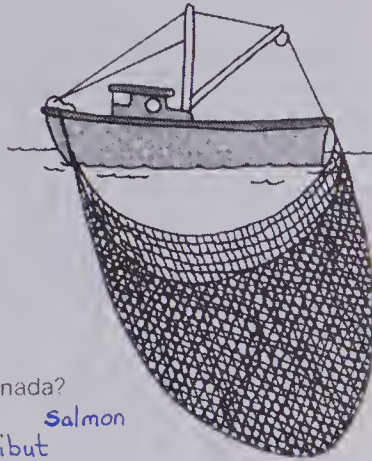
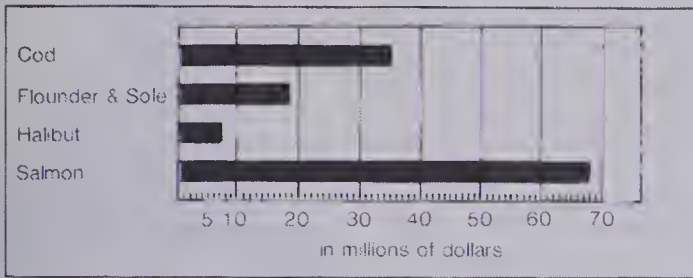
Mackenzie	4242 km	4250 km
Yukon	3186 km	3200 km
St. Lawrence	3059 km	3050 km
Nelson	2576 km	2600 km
Churchill	1932 km	1950 km
Peace	1923 km	1900 km



# Sea Fisheries

The Government keeps a record of the catches from the seawaters around Canada's shores.

Value of Catches in Canadian Seawaters



- Which of the catches shown brings the most money to Canada? *Salmon*
- Which of the catches shown brings the least money? *Halibut*
- What catch is about half the value of the salmon catch? *Cod*
- What is the value of the halibut catch? *\$7 000 000*
- What information is being compared in the bar graph? *The value of catches in Canadian sea-waters*

Draw a bar graph to show this data

- Number of Immigrants to the United States from Canada

Year	Number
1976	21 380
1972	25 240
1968	20 420
1964	12 570
1960	11 250
1956	9 780

## BRAINTICKLER

The typist got letters and numbers mixed. What digits (0, 1, 2, 3, ..., 9) should replace the letters?

$$\begin{array}{r}
 2R18 \\
 +197T \\
 \hline
 X5S3
 \end{array}
 \qquad
 \begin{array}{r}
 814F \\
 -1M75 \\
 \hline
 Z7N5
 \end{array}$$

Reading and drawing bar graphs 179

## ACTIVITIES

1. Review basic facts by assigning the game "Number Sentence" as described in the Activity Reservoir.

2. Provide some skill maintenance exercises on cards or sheets for the pupils to complete. Also provide graph paper (1 cm squares — DM46) and have students construct their own bar graphs to chart their progress.

Number of Exercises Carol did Superbly				
e				
d				
c				
b				
a				
	Example 1	Example 2	Example 3	Example 4

As a source for exercises, see the appropriate Extra Practice page (page 336) at the back of the student's book.

3. Select topics from social studies or science to use as possible bar graphs, e.g., number of immigrants to Canada in certain years (or from certain countries), distances to certain planets from Earth, and so on.

*Examples*

Graph this data.

### Leading Sources of Imports to Canada

United States	\$21 206 000
Japan	1 423 000
Venezuela	1 289 000
United Kingdom	1 127 000
Germany	764 000

### Where Immigrants to Canada took up Residence

Atlantic Provinces	4 680
Quebec	24 360
Ontario	86 440
Prairie Provinces	18 390
British Columbia and N.W.T.	24 859

## EXTRA PRACTICE

Ask the students to draw bar graphs for the data represented by the pictographs in Activities 1, 2, and 3 on pages 176 and 177 of the teaching notes.

ANSWERS:

Braintickler

$R=6$ ;  $T=4$ ;  $X=5$ ;  $S=9$        $F=0$ ;  $M=3$ ;  $Z=6$ ;  $N=6$

## OBJECTIVES

To interpret a broken line graph  
To draw a broken line graph

## PACING

Level A All  
Level B All  
Level C All

## BACKGROUND

Broken line graphs should be used only for continuous data. However, they are sometimes used for other data that might well be better illustrated by bar graphs. The pupil display on page 180 is one such graph. It is included to make this point. (See Exercise 7.) A broken line graph is used to show a trend.

## SUGGESTIONS

**Initial Activity** Introduce broken line graphs by using a current one collected from a newspaper or magazine. Discuss the trend(s) that is (are) illustrated.

## USING THE BOOK

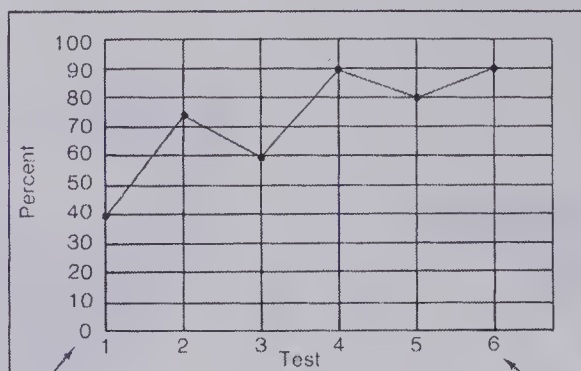
Use the words “vertical” and “horizontal” for the two scales since they will be used in coordinate graphing. Suggest that the trend in the graph is more clearly seen when the broken line is drawn than if the dots alone were used.

Ask: if Metro’s marks continue on the pattern established over the 6 tests, how do you think he will do on Test 7? [One answer: less than on Test 6 since he has gone up, then down; up, then down; etc. Or, slightly better than before since, generally, his marks have been getting better.]

After the students complete the exercises for each graph, ask if there is a trend established? [Exercise 8 — no; Exercise 12 — possibly; Exercise 16 — definitely (increasing)].

## Broken Line Graphs

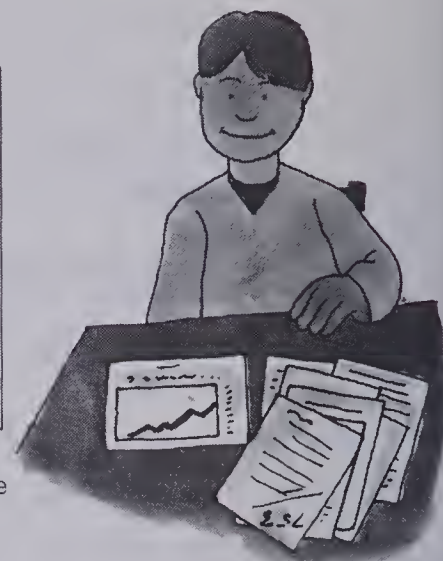
Metro kept a record of his test marks.



Vertical scale

Horizontal scale

Broken line graphs are used to show change.



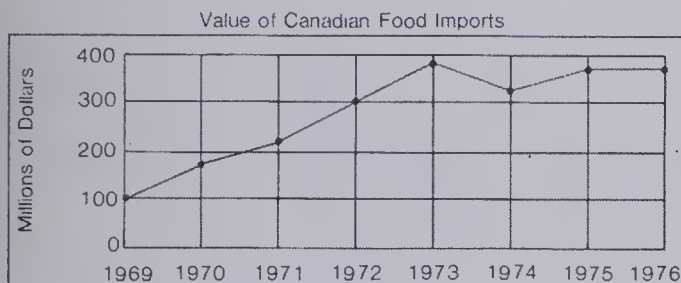
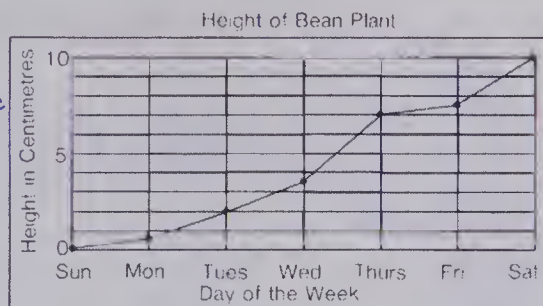
### Exercises

1. What do the numbers along the horizontal scale indicate? *The test number*
2. What do the numbers along the vertical scale indicate? *The percent*
3. Did Metro's test mark improve from Test 1 to Test 2? *Yes*
4. What happened to Metro's test mark from Test 2 to Test 3? *It decreased*
5. Was there more improvement between Test 1 and Test 2 or Test 5 and Test 6? *Test 1 and Test 2. Up*
6. In what direction is the slant of the line that shows improvement? that shows a decline in marks? *Down*
7. Does a point on the line between Test 3 and Test 4 indicate another test and mark? *No*  
Explain. *There were no tests between Test 3 and Test 4.*



Karen made a graph when her bean plant started to grow.

8. What change is being shown? *The change in the height of the bean plant.*
9. Between which two days is the greatest change shown? *Between Wednesday and Thursday.*
10. What was the height of the plant on Thursday? *7 cm*



*The value of Canadian food imports from 1969 to 1976.*

11. What information is provided in the graph?
12. During which year did the value of food imports increase the most over the previous year? *1973*

13. In which year was there a decrease in food imports compared to the previous year? *1974*
14. What was the approximate value of food imports in 1975? *\$370 000 000*
15. Draw a broken line graph.

Number of air passengers between Vancouver and Winnipeg

1968	1969	1970	1971	1972	1973	1974
63 000	82 000	90 000	85 000	95 000	121 000	128 000

16. Several students recorded the length of their shadows every 30 min. Here is what David wrote:

Time	09:00	09:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30
Length in Centimetres	130	110	94	82	74	70	68	70	74	82

Draw a broken line graph for this data.

## ACTIVITIES

1. Have the students bring samples of broken line graphs. These may be collected from newspapers and magazines. The student should write a summary of what his or her graph tells the reader. Discuss these in class or post them on the bulletin board.

2. Have the students draw a broken line graph for the data in Exercise 6, page 179, of the student's text.

3. Ask the students to collect the data and draw a broken line graph to show the population of Canada from 1900 to 1980. *Hint: Collect data for 1900, 1910, 1920, ..., 1980.*

## OBJECTIVES

To review and maintain computational skills  
To review and maintain geometric skills

## PACING

Level A All  
Level B All  
Level C Optional

## USING THE BOOK

*Part 1.* Assign Exercises 1 and 5, 6 and 10, 11 and 15, 16 and 20. Those getting both of a pair correct need not do the balance in the set.

Assign all of *Part 2*. Refer students to additional drill on any skill not adequately mastered. To do this, you will have to determine whether the errors were from lack of skill or carelessness.

If students have unusual difficulty with these problems, you may wish to provide appropriate remedial activities. The following chart shows where the various topics were presented in the text.

### Tune Up *Part 1*

Exercise	Page
1-5	27
6-8	7, 12
9	3
10	11
11, 12	16
13	86
14	93
15	94
16, 17	107
18, 19	145

### Tune Up *Part 2*

Exercise	Page
1	39
2	41
3	42
4	116
5	155

## ACTIVITIES

1. See the "Fact Folder" idea on page 152, Activity 2, of the teaching notes.
2. See "Slalom" as described in the Activity Reservoir.
3. See "Omega-Y" as described in the Activity Reservoir.

## Tune Up *Part 1*

Round each to the nearest hundred.

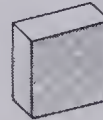
1. 467 **500**
2. 5678 **5700**
3. 72 340 **72 300**
4. 7555 **7600**
5. 64 440 **64 400**

Calculate.

6. 
$$\begin{array}{r} 23.1 \\ 4.6 \\ + 3.5 \\ \hline 31.2 \end{array}$$
7. 
$$\begin{array}{r} 18.12 \\ 26.29 \\ + 80.01 \\ \hline 124.42 \end{array}$$
8. 
$$\begin{array}{r} 43.15 \\ 23.80 \\ + 89.07 \\ \hline 156.02 \end{array}$$
9. 
$$\begin{array}{r} 89 \\ -26 \\ \hline 63 \end{array}$$
10. 
$$\begin{array}{r} 8.9 \\ -5.2 \\ \hline 3.7 \end{array}$$
11. 
$$\begin{array}{r} 6.04 \\ -1.87 \\ \hline 4.17 \end{array}$$
12. 
$$\begin{array}{r} 14.00 \\ - 8.21 \\ \hline 5.79 \end{array}$$
13. 
$$\begin{array}{r} 317 \\ \times 64 \\ \hline 20288 \end{array}$$
14. 
$$\begin{array}{r} 374 \\ \times 0.8 \\ \hline 299.2 \end{array}$$
15. 
$$\begin{array}{r} 127.4 \\ \times 4.8 \\ \hline 611.52 \end{array}$$
16.  $346 - 10$  **34.6**
17.  $564 - 100$  **5.64**
18.  $37 \overline{) 654}$  **17 R25**
19.  $64 \overline{) 7094}$  **110 R54**

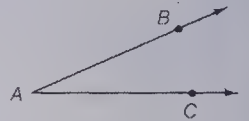
## Tune Up *Part 2*

1. This is a tall, thin box.  
Draw a shallow, wide box.



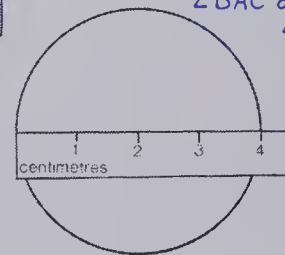
2. Name this angle.

**$\angle BAC$  or  $\angle CAB$**



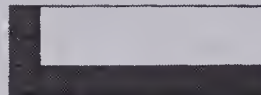
3. What is the radius of this circle?

**2 cm**



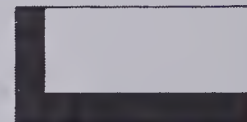
4. Calculate the perimeter of this rectangle.

**24 units**

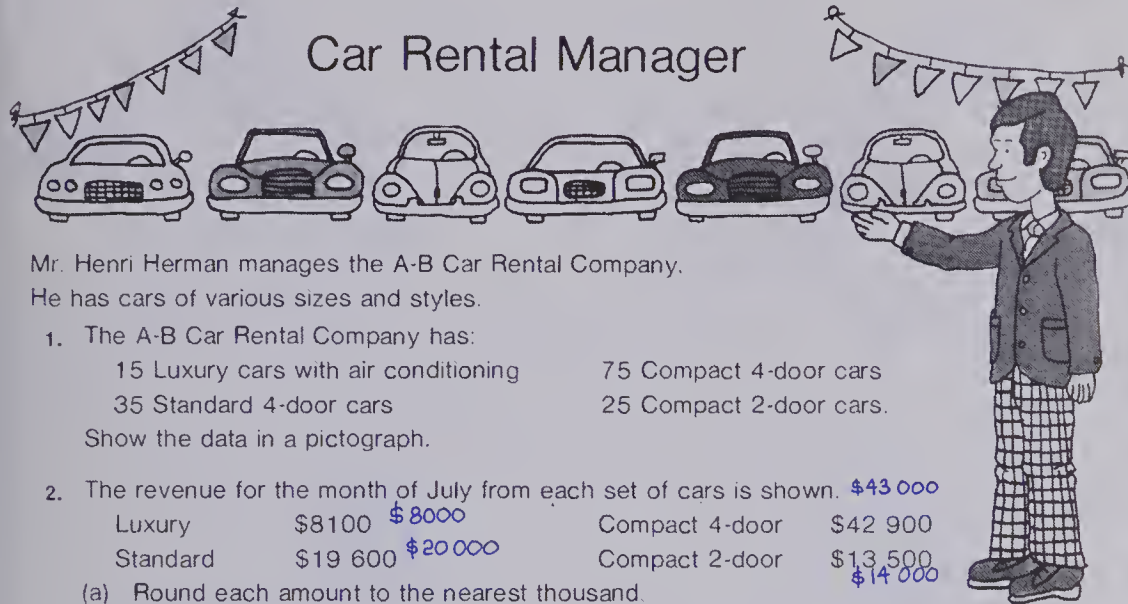


5. Calculate the area of this rectangle.

**32 square units**



## Car Rental Manager



Mr. Henri Herman manages the A-B Car Rental Company. He has cars of various sizes and styles.

- The A-B Car Rental Company has:
 

15 Luxury cars with air conditioning	75 Compact 4-door cars
35 Standard 4-door cars	25 Compact 2-door cars.

Show the data in a pictograph.
- The revenue for the month of July from each set of cars is shown. **\$43 000**

Luxury	\$8100	<b>\$8000</b>	Compact 4-door	\$42 900
Standard	\$19 600	<b>\$20 000</b>	Compact 2-door	\$13 500

(a) Round each amount to the nearest thousand.  
 (b) Show the rounded data in a bar graph.
- Mr. Herman kept a log of the distances each car was driven on each rental. The odometer readings in kilometres of car 25B are shown on the rental log:

A-B Car Rentals		Car # 25B		
		Kilometres		Distance
		Take Out	Return	
1		3 512	8 122	<b>4610</b>
2		8 140	9 080	<b>940</b>
3		9 100	9 208	<b>108</b>
4		9 222	13 700	<b>4478</b>
5		13 727	15 090	<b>1363</b>

- (a) Copy and complete the chart.  
 (b) Draw a broken line graph to show distances driven on the rentals. (Round first!)
- ★ 4. Which type of car returned the most money per car during the month of July? **Compact 4-door.**

## OBJECTIVE

To use graphs to display data from a vocational field

## PACING

Level A 1, 2  
 Level B 1-3  
 Level C 2-4

## VOCABULARY

odometer, rental log

## SUGGESTIONS

**Initial Activity** Discuss the kind of work a person does in the car rental business. (See the Career Awareness notes in the Chapter Overview, page 164.) Can a woman enter this field of work? Is it hard physical work? Does it require extensive training? Does a person have to be good at calculations? Is there a lot of calculating? What type of people would you be dealing with? What are the working conditions: hours, inside or outside, busy hours, etc?

## USING THE BOOK

Have students with a weakness in reading work together in reading the problems. After reading a problem, have them solve the problem separately.

## ACTIVITIES

1. You may want students to prepare a bulletin-board display on the rental business in your area. They might discuss the contribution these businesses make to their community. Discuss when slack times and busy times would be for a certain rental business.

2. Prepare a graph to show the number of letters in the complete names of each student in the group.

3. Prepare graphs to show for each student in the group: (a) the number of times consonants are used in each full name, (b) the number of times vowels are used in each full name.



## OBJECTIVE

To solve mentally equations of the type:

(a)  $7 + M = 10$

(b)  $6 \times B = 54$

## PACING

Level A All

Level B All

Level C All

## VOCABULARY

constellation, Canis Major, Omega, Rainus, Angella

## BACKGROUND

Pages 184 to 187 develop the concept of a function or relation intuitively. Pages 184 to 185 develop the ability to complete the relation given several ordered pairs. Pages 186 to 187 require the student to find the ordered pairs and to graph them, i.e., to graph the relation given by the ordered pairs.

## SUGGESTIONS

**Initial Activity** Use the robot idea as a motivator. You might challenge your students by asking one for a number which you write on the chalkboard, then you say the robot tells me to write  $\blacksquare$  (you add 5 to it and write down the answer you get). Then ask for another number and repeat the process. On the next number given, challenge the students as to what you should write. Continue this until a number of students can tell you what rule you are following.

*Examples*

$13 \longrightarrow 18$

$27 \longrightarrow 32$

$45 \longrightarrow ?$

$51 \longrightarrow ?$

Repeat for multiplying by 3.

$9 \longrightarrow 27$

$12 \longrightarrow 36$

$15 \longrightarrow ?$

$20 \longrightarrow ?$

## USING THE BOOK

On a large card for the display-sized robot, print the input and output numbers shown in Exercise 1. Ask the class what rule Omega-Y uses.  $[+ 6]$  Give other inputs and ask what the outputs will be for each.

Assign Exercises 3 and 4.

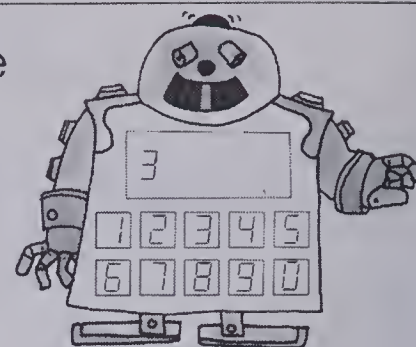
## ACTIVITIES

1. Challenge your class to draw and colour a futuristic robot that can calculate and display answers. Encourage them to provide a large

## Space Age

Students from Constellation Canis Major have a robot.

When a number is put in (input), Omega-Y uses a rule and flashes back an answer (output).



### Exercises

1. Rainus, a student, gave Omega-Y some numbers.

Input	Output
3	9
4	10
5	11

What rule did Omega-Y use? *Add 6.*

3. Omega-Y used the rule:  
Input — a number  
Output — 4 times the number.  
Copy and complete this table.

Input	Output
1	4
2	8
6	
8	
12	
15.5	
38.9	

*24  
32  
48  
62.0  
155.6*

2. Angella recorded these inputs and outputs.

Input	Output
7	30
9	32
11	34
13	
15	
17	

*36  
38  
40*

- (a) Copy and complete the table.  
(b) What rule did Omega-Y use? *Add 23.*

4. Omega-Y used the rule:  
Input " $\times 2.3$ " = Output.

Input	Output
1	2.3
2	4.6
3	
5	
10	
15	

*6.9  
11.5  
23.0  
34.5*

Copy and complete the table.

184 Functions. 1-step rule

screen so rules as well as answers can be shown. They may want to name their robots.

2. Make a large classroom robot with a display pocket into which large cards can be placed. Rules can be written on the cards.

3. The students can take turns making up sets of input and output cards for Omega-Y using some rule. Challenge the other students to discover the rule by giving the fourth output.

Input	Output
27	21
22	16
36	30
12	?

## EXTRA PRACTICE

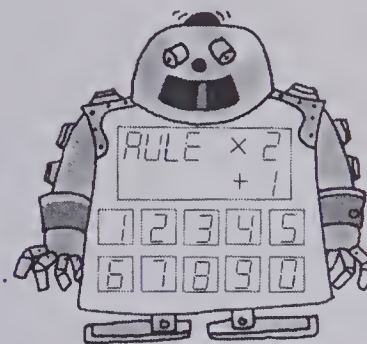
Copy and fill in the missing numbers.

A	15	9	3	12	6	18
B	3	3	3	3	3	3
A + B	[18]	[12]	[6]	[15]	[9]	[21]
A - B	[12]	[6]	[0]	[9]	[3]	[15]
A $\times$ B	[45]	[27]	[9]	[36]	[18]	[54]
A $\div$ B	[5]	[3]	[1]	[4]	[2]	[6]

## Omega-Y

Starius, another student of Constellation Canis Major, recorded this table of inputs and outputs.

Input	Output
1	3
2	5
3	7
4	9



Omega-Y used the rule:

Multiply by 2 and add 1.

### Exercises

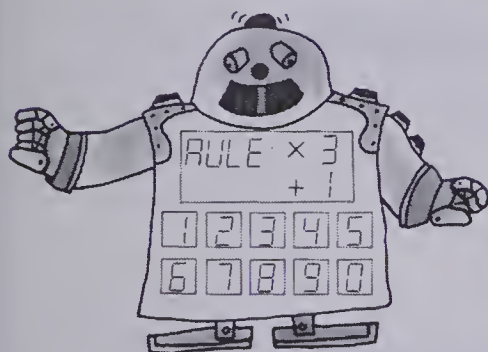
- Use the rule: Multiply by 2 and add 1.

Copy and complete each table.

Input	Output
4	9
5	11
6	13
7	15

Input	Output
10	21
20	41
30	61
40	81

- Copy and complete this table. Watch for the new rule!



Input	Output
1	4
2	7
3	10
4	13
7	22

Input	Output
1	6
2	10
3	14
5	22
10	42
15	62

- Copy and complete the table.

Rule: Multiply by 4 and add 2.

## OBJECTIVE

To make a table of values given the rule for the function or relation

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

Omega-Y robot model made in previous activities

## BACKGROUND

Here, the pupils are given a 2-step rule and a set of inputs. They must calculate the outputs.

## USING THE BOOK

On a card, write the rule and the set of inputs shown in the pupil display at the top of the page. Ask the students to give you the outputs. Write them on the card. Discuss the display. Ask individual students to do each output orally: 1 times 2 is 2 and 2 plus 1 is 3; 2 times 2 is 4 and 4 plus 1 is 5; etc. Refer students to the display. Assign the balance of the exercises.

Rule: $\times 2, + 1$	
Input	Output
1	3
2	5
3	7
4	9

For Exercise 2, you may wish to point out that the "new rule" is shown on Omega-Y's read out (i.e., " $\times 3, + 1$ ").

Functions 2-step rule 185

## ACTIVITIES

- Have students take turns making up a rule and a set of inputs on cards for the class size Omega-Y. The other students are to copy and complete the chart.

Rule: $\times 10, + 50$	
Input	Output
10	150
20	250
30	350
70	750
80	850

- See "Input-Output" as

described in the Activity Reservoir.

- Pupils might enjoy this group activity. Choose any number you like between 5 and 12 and then follow these steps.

- Multiply your number by 2.
- Add 12.
- Find one half of the number you have now.
- Subtract the number you started with.
- Multiply the number you have left by 7.

Try these rules with other numbers. What do you notice about the answers? [The answer is always 42.]

OBJECTIVE

To complete the table of values for the function (relation)  $d = rt$  given  $t$  and  $r$  values

PACING

- Level A 1-7
- Level B 1-8
- Level C 1-5, 9, 10

VOCABULARY

Tewari, km/h (kilometres per hour), pendulum

MATERIALS

graph paper

RELATED AIDS

HMS — DM45.

USING THE BOOK

Discuss the information in the pupil display. How did Tewari find the potential distances: 100, 150, 200? [Multiply 50 by 2, 3, and 4: the distance per hour times the number of hours.] Ask: "Why do you think he only planned to travel an average of 50 km/h?" [To allow for stops for lunch, sightseeing, stop lights, corners, etc.]

What do we mean by "average"? [While at times Tewari may travel at 100 or 120 km/h and at times 0 km/h; overall, he will travel about 50 km in each hour.]

Discuss how the graph is drawn: the scale is set and marked in equal units of one hour on the horizontal scale and 50 km units on the vertical scale; the ordered pair (1, 50) is graphed; etc. The line joining the graphed points is drawn. Elicit from the students that this line is straight for all the graphs in this lesson.

You may wish to provide graph paper to facilitate the completion of the exercises.

Be sure to point out that, in Exercise 4, Tewari "made another plan" and that, therefore, the table and graph will be different. Also, Exercise 9 will require a different scale than the other exercises.

Read through Exercise 10 with your Level C students, going through the instruction flow chart that Lori followed and relating it to the Pendulum Study graph.

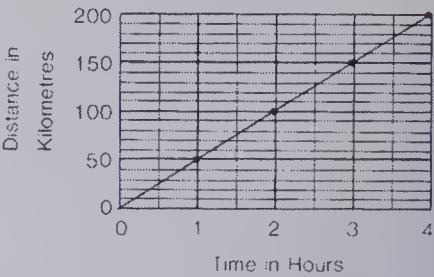
Time and Distance

Tewari was planning a car trip. "We will average about 50 km in 1 h. In 2 h we will go 100 km."

He made this table.

Time in Hours	0	1	2	3	4
Distance in Kilometres	0	50	100	150	200

He made this graph.



Exercises

- 1. What did Tewari do to calculate how far they would go in 2 h? in 3 h? *Tewari multiplied the number of hours by 50.*
- 2. Use the graph. Approximately how far would they go in 1.5 h? 2.5 h? *75 km 125 km*
- 3. To make the table Tewari used the rule: Multiply the number of hours by  $\blacksquare$  50
- 4. Tewari made another plan. He planned to travel 90 km in each hour.

(a) Copy and complete this table.

Time in Hours	0	1	2	3	4	5
Distance in Kilometres	0	90				

(b) What rule did Tewari use this time? *180 270 360 450*

*Multiply the number of hours by 90.*

- 5. Make a line graph using the data in the table in Exercise 4. Use a graph similar to the one at the top of this page.
- 6. Tewari's older sister, Grace, planned to ride her motorbike. She planned to travel 40 km each hour.

(a) Copy and complete the table.

Time in Hours	0	1	2	3	4	5
Distance in Kilometres	0	40				

(b) What rule did Grace use? *80 120 160 200*

(c) Make a line graph to show the information.

*Multiply the number of hours by 40.*



7. (a) Copy and complete this table for a bicycle trip at 15 km/h (fifteen kilometres per hour).

Time in Hours	0	1	2	3	4	5
Distance in Kilometres						

- (b) What rule did you use? *Multiply the number of hours by 15.* (c) Make a line graph.

8. (a) Copy and complete this table for a trip at 75 km/h.

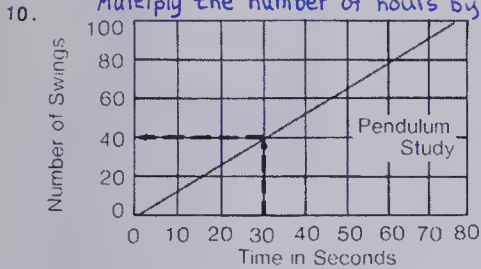
Time in Hours	0	1	2	3	4	5
Distance in Kilometres	0	75				

- (b) What rule did you use? *Multiply the number of hours by 75.* (c) Make a line graph.

9. (a) Copy and complete this table for an airplane trip at 900 km/h.

Time in Hours	0	1	2	3	4
Distance in Kilometres					

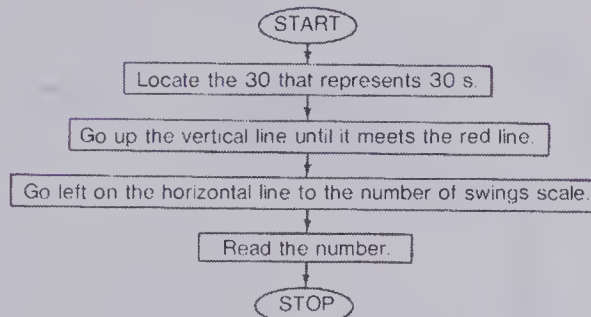
- (b) What rule did you use? *Multiply the number of hours by 900.* (c) Make a line graph.



Jeff's group did a pendulum experiment. This is the graph they drew from the data. Lori studied the graph.

- (a) To find the number of swings the pendulum made in 30 s, Lori followed this flow chart.

- (b) About how many swings did the pendulum make in  
(i) 60 s? (ii) 15 s?  
(iii) 45 s? (iv) 50 s?



## ACTIVITIES

1. Have the students collect straight line graphs from magazines and newspapers. Each should write a sentence stating the message in each graph.

2. Ask the students to make up a similar graph given that 0 rides on the midway cost \$0 and that 6 rides cost \$4.50. Then ask the cost of:  
(a) 1 ride (b) 3 rides (c) 8 rides (d) 10 rides.

How many rides can one get for:

(a) \$1.00 (b) \$2.00 (c) \$7.50?

Is it reasonable to ask how much 2.5 rides would cost? Why?

3. Ask students to draw a graph of a relation that will produce a straight line graph. Examples: cost of tennis balls when the price of one is known; cost of admission to movies for different numbers of people when the cost of one admission is known; the mass of a certain number of bricks when the mass of one is known; etc.

### ANSWERS:

7. (a) 0 15 30 45 60 75 8. (a) 150 225 300 375 9. (a) 0 900 1800 2700 3600  
10. (b) (i) 80 (ii) 20 (iii) 60 (iv) 67

OBJECTIVE

To write an ordered pair to describe a location in a column and row situation

PACING

- Level A All
- Level B All
- Level C All

VOCABULARY

column, row

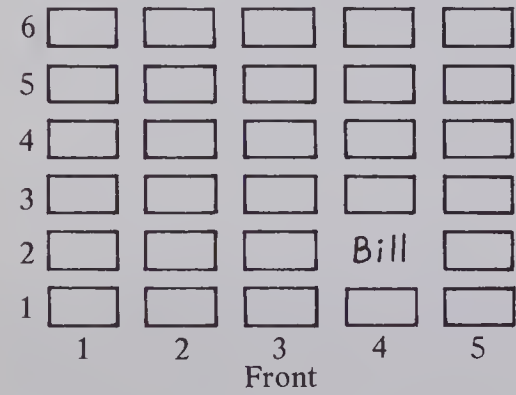
BACKGROUND

This page is the beginning of the formal development in this book of the coordinate plane for graphing ordered pairs. This system of graphing was developed by Rene Descartes.

SUGGESTIONS

**Initial Activity** If your classroom is not arranged in rows and columns, have the students put their chairs into rows and columns (you may wish to use an empty room or gym to do this). Starting on the students' right, name the columns 1, 2, 3, etc. Starting with the front row, number the rows 1, 2, 3, etc. Call out an ordered pair (column first, row second). The student in that seat calls out his name. Example: Teacher: (4, 2) Student: "Bill".

Do not use the term "ordered pair" yet. Develop the concept first. Then, let each student call out a pair of numbers — column first, row second, i.e., an ordered pair. The rest of the class calls the name of the student in that location. Then, call a student's name. He or she has to give the correct ordered pair.

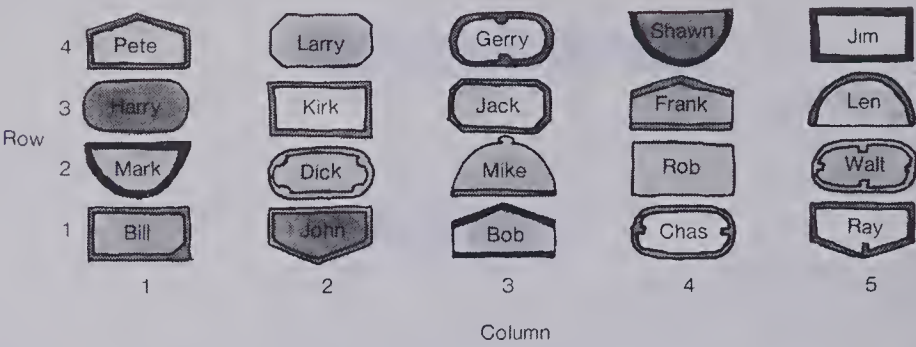


USING THE BOOK

Read through the names and locations in the display at the top of the pupil page. Point out the similarities to what was done during the Initial Activity demonstration (especially, column first, row second). Discuss any dissimilarities (i.e., in the book, we use a "map" of locations but during the class demon-

On Parade

The Boy Scouts lined up for a parade.

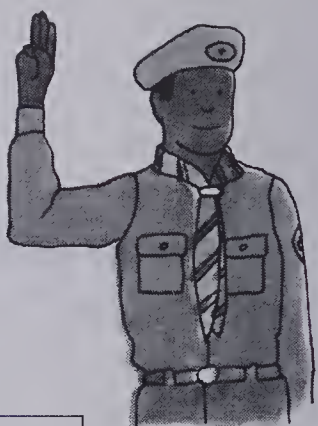


Exercises

- Rob is at place (4, 2). What column is he in? 4  
What row is he in? 2
- Harry is at place (1, 3). What column is he in? 1  
What row is he in? 3
- Who is at the place (2, 3)? Kirk
- Who is at the place (3, 2)? Mike
- How is (2, 3) different than (3, 2)?  
How are they the same?

Use this rule:

Always name the column first, then the row.



- Who is in the spot?  
(a) (4, 2) Rob (b) (1, 4) Pete (c) (4, 1) Chas (d) (5, 2) Walt
- Write the number pair for the place of each Boy Scout.  
(a) Mark (1,2) (b) Larry (2,4) (c) Frank (4,3) (d) Len (5,3)

188 Meaning of ordered pairs

stration, we used real people, etc.). Do Exercises 1 to 5 orally with the whole class or in small groups. Assign Exercises 6 and 7.

ACTIVITIES

- Arrange classroom objects (i.e., ruler, scissors, pen, etc.) on a clear space on the floor or on a large table top. Number the columns and rows as was done in the Initial Activity. Have the students practise naming objects and their locations.

- Have the pupils make their own arrangements using objects as in Activity 1. Have them challenge classmates with several cards such as: "Name the item at location (2, 4)." "Where is the red pencil?" "The black pen is at location (3, 2). True or False?" and so on.
- Provide students with a sheet of grid paper in squares of about 2 cm. The students are to record in each square the name of the students in the class according to the seat in which they sit.



## Going Camping

The tents in a girl's camp are set up in columns and rows as shown:

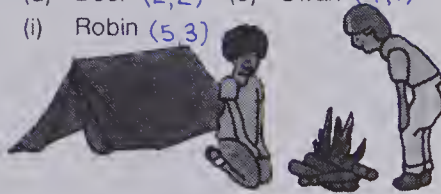
	4	Wren	Wolf	Canary	Coyote	Owl
Row	3	Beaver	Fox	Hawk	Duck	Robin
	2	Bat	Deer	Crow	Goose	Bear
	1	Cat	Moose	Eagle	Swan	Cub
		1	2	3	4	5
		Column				

The location of a tent is given by an **ordered pair**: first the column number, then the row number.

The Bear tent is located by the ordered pair (5, 2).

### Exercises

- Give the name of the tent at each location.  
 (a) (2, 1) **Moose** (b) (4, 3) **Duck** (c) (5, 4) **Owl** (d) (1, 4) **Wren** (e) (3, 3) **Hawk**  
 (f) (2, 3) **Fox** (g) (4, 4) **Coyote** (h) (5, 1) **Cub** (i) (3, 2) **Crow**
- Write the *ordered pair* that locates each tent.  
 (a) Beaver (1, 3) (b) Canary (3, 4) (c) Bear (5, 2) (d) Deer (2, 2) (e) Swan (4, 1)  
 (f) Coyote (4, 4) (g) Bat (1, 2) (h) Eagle (3, 1) (i) Robin (5, 3)
- Which tent is at (4, 2)? **Goose**  
 Which tent is at (2, 4)? **Wolf**  
 Does (2, 4) and (4, 2) locate the same tent? **No**
- Marty lives in Cub tent.  
 She walked to Wren tent.  
 How many rows did she cross? **3**  
 How many columns did she cross? **4**



- Shelley went from (4, 3) to (2, 1).  
 How many rows did she cross? **2**  
 How many columns did she cross? **2**

Ordered pairs: locating points 189

## OBJECTIVE

To locate and to identify an item in a set arranged in columns and rows using ordered pairs

## PACING

Level A All  
 Level B All  
 Level C All

## VOCABULARY

ordered pair

## BACKGROUND

An ordered pair is the name given to two names, numbers, or symbols that are arranged in a special order. The ordered pair (4, 2) is quite different than (2, 4). It is customary to write ordered pairs in parentheses.

## SUGGESTIONS

**Initial Activity** You may wish to review the points that were covered on page 188; namely, (a) always name the column first and row second, (b) we can use number pairs to help name locations.

## USING THE BOOK

Discuss the pupil display. Print out what is meant by "ordered pair" as you proceed through the exercises.

Do this page orally. Elicit students' responses to Exercise 3, particularly, and bring out the meaning of "ordered pair" here.

If difficulties are experienced with Exercises 4 and 5, refer to the Initial Activity on page 188 and ask similar questions about students in your classroom.

## ACTIVITIES

- Play "Mental Maps".

3	knife	dime	pen
2	hockey card	spoon	elastic band
1	keys	pencil	cup
	1	2	3

Prepare a tray using from 9 to 16 common items from the class and/or home. Display them and number the columns and rows. Allow the group two or three minutes to look at the tray and

memorize the contents and their locations. Then, cover the tray completely and ask questions such as: "Name all 9 (or 10) items." "Where was the spoon?" "Where were the keys?" and so on.

2. Students might enjoy preparing their own "Mental Maps" as described in Activity 1. It is an excellent activity to sharpen memory and increase concentration skills.

3. Have students draw a picture of a car parking lot and show how the cars can be arranged so that each can be located by an ordered pair.



OBJECTIVE

To identify vertical and horizontal lines drawn on a page

PACING

- Level A All
- Level B 2-4
- Level C 3, 4

VOCABULARY

horizontal, vertical

BACKGROUND

Many students have difficulty with coordinate graphing because they fail to understand the concepts of horizontal and vertical.

SUGGESTIONS

**Initial Activity** Hold a metrestick horizontally. Then say, "This stick is horizontal. It points to the horizon." (Point to indicate where the horizon is. If necessary, explain what the horizon is.) Repeat for vertical. Vertical means "straight up or overhead". Then show how to represent these on the chalkboard.

Ask the students to hold their books upright in front of them and draw horizontal lines and vertical lines along the edges. It may also be helpful to refer to the "horizontal" and "vertical" knobs found on most television sets.

USING THE BOOK

Discuss the pupil display. You might do this page orally as an Initial Activity to page 191.

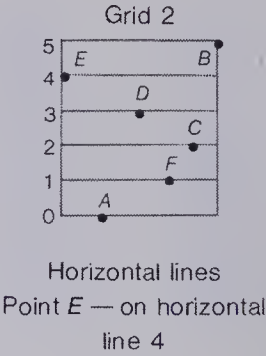
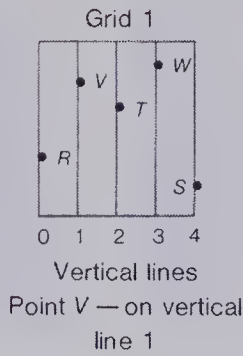
ACTIVITIES

- On the chalkboard, have students prepare two lists of lines found in the schoolyard.  

Horizontal Lines	Vertical Lines
window ledge	flag pole
sidewalk	hinged edge of door
- Have the students make horizontal and vertical lines on a geo-board.
- Use a geo-board and elastics. How many ways can you make rectangles with these areas?  

(a) 24 squares	(b) 15 squares
(c) 11 squares	(d) 42 squares
(e) 30 squares	(f) 21 squares
(g) 12 squares	(h) 17 squares
(i) 32 squares	

Vertical and Horizontal



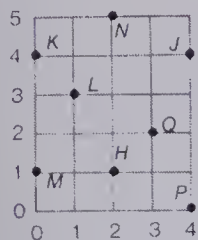
Exercises

Use Grids 1 and 2.

- Name the line each letter is on.  
(a) T Vertical line 2 (b) S Vertical line 4 (c) B horizontal line 5 (d) A horizontal line 0 (e) C horizontal line 2 (f) W Vertical line 3
- Name the letter on the line.  
(a) vertical line 0 R (b) horizontal line 1 F (c) vertical line 1 V (d) horizontal line 3 D (e) horizontal line 4 E

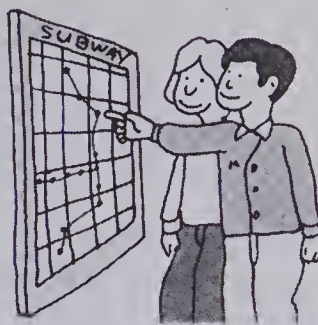
- Name each line as horizontal or vertical.  
(a) vertical (b) horizontal (c) vertical (d) vertical (e) horizontal (f) horizontal (g) horizontal (h) vertical
- Is each letter a horizontal or vertical line?  
A vertical, K horizontal, C vertical, J horizontal, E vertical, F horizontal, B horizontal, G vertical, D vertical, H vertical, I horizontal

## Using Grids



Point Q — on vertical line 3  
— on horizontal line 2

(3, 2) is called an **ordered pair**.



### Exercises

1. Name the letters on these lines.

(a) vertical line 1, horizontal line 3 **L**  
(c) vertical line 4, horizontal line 0 **P**

(b) vertical line 2, horizontal line 5 **N**  
(d) vertical line 2, horizontal line 1 **H**

2. Name the letters with these ordered pairs. Remember! Vertical first.

(a) (3, 2) **Q** (b) (0, 1) **M** (c) (0, 4) **K** (d) (4, 4) **J**

3. Write the ordered pair for these points. Remember! The vertical line first.

A B C D E F  
G H I J K L M

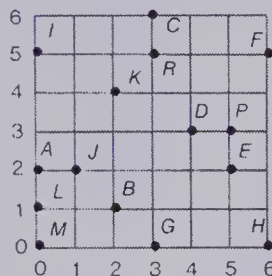
4. How is (5, 3) different from (3, 5)?  
**P** -- vertical line 5, horizontal line 3  
**R** -- vertical line 3, horizontal line 5

5. Copy the ordered pairs below. Match the letters with the pairs.

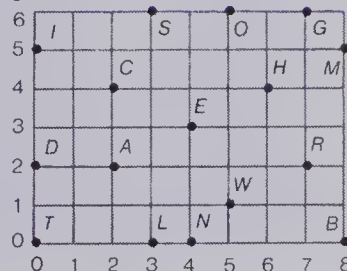
What rides on a gold broom?

(2, 2) **A** (7, 2) **R** (0, 5) **I** (2, 4) **C** (6, 4) **H**

(5, 1) **W** (0, 5) **I** (0, 0) **T** (2, 4) **C** (6, 4) **H**



A (0, 2) B (2, 1) C (3, 6)  
D (4, 3) E (5, 2) F (6, 5)  
G (3, 0) H (6, 0) I (0, 5)  
J (1, 2) K (2, 4) L (0, 1)  
M (0, 0)



Locating points on a grid 191

## OBJECTIVES

- To write an ordered pair for a point on a grid
- To graph a point on a grid given the ordered pair for the point

## PACING

- Level A 1-3, 5
- Level B All
- Level C All

## VOCABULARY

ordered pair

## RELATED AIDS

HMS — DM46 and DM47.

## BACKGROUND

At this time we begin to move away from the earlier method of locating a point (over and up) toward the approach of intersecting vertical (first) and horizontal (second) lines. Hence, the concepts of vertical and horizontal lines are emphasized. Given the ordered pair for a point, one first locates the vertical line, then the horizontal line, and marks the intersection of these two lines as the graph of the point.

## SUGGESTIONS

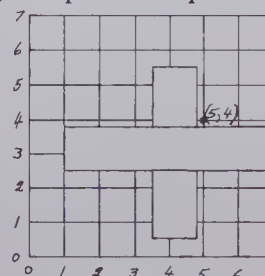
**Initial Activity** See Using the Book on page 190.

## USING THE BOOK

Discuss the meanings of "vertical" and "horizontal". Ask students to identify objects and lines which are vertical or horizontal. As an aid to keeping the two clear in the students' minds, always talk about the vertical line first.

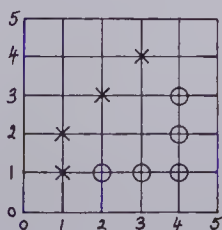
Introduce and discuss the term "ordered pair". Using the display at the top of the pupil page, discuss why (0, 4) and (4, 0) are not the same. You may wish to do Exercises 1 to 4 orally as a group exercise and assign Exercise 5 as independent work.

If some students experience difficulty in locating the intersection of vertical and horizontal lines, direct them to cut two paper strips, colour one edge of each and place one along the vertical line and the other along the horizontal line. This will help in marking the point of intersection and in locating the point in question.



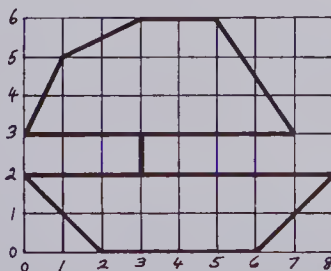
## ACTIVITIES

1. Students might enjoy playing a variation of "Tic Tac Toe". Each student in a pair is given a 6 line  $\times$  6 line grid labelled 0 to 5 on each axis as shown. Each player calls an ordered pair in turn and marks an X or O on that point. The object is to get four of one kind (X's or O's) in a straight row — vertically, horizontally, or diagonally. Blocking the opponent is important in the strategy of the game. The first player to get four in a row is the winner.



2. Complete simple "connect-the-points" pictures on grids up to  $10 \times 10$ . A sample is shown.

- (a) Graph the points.  
(b) Connect each point to the next using a heavy line to complete the picture.



Start: (3, 2), (0, 2), (2, 0), (6, 0), (8, 2), (3, 2), (3, 3), (0, 3), (1, 5), (3, 6), (5, 6), (7, 3), (3, 3)

3. Have the pupils prepare their own "connect-the-dot" activities for exchange with other groups or classmates.

## OBJECTIVE

To locate points on a road map that is superimposed with a grid (using ordered pairs)

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

See various names on the map.

## MATERIALS

atlases

## BACKGROUND

This exercise will provide the student with a practical use for ordered pairs. However, in this work, the spaces are numbered, not the lines, as in the previous exercises. The map on the pupil page emphasizes this point since the spaces labelled E and 3 are coloured.

Atlases commonly use an ordered pair to identify the location of places. Some use ordered triples: page number, vertical location, and horizontal location.

## SUGGESTIONS

**Initial Activity** If suitable, use a map of your community that is appropriately superimposed with a square grid. Locate specific places using an ordered pair as identification.

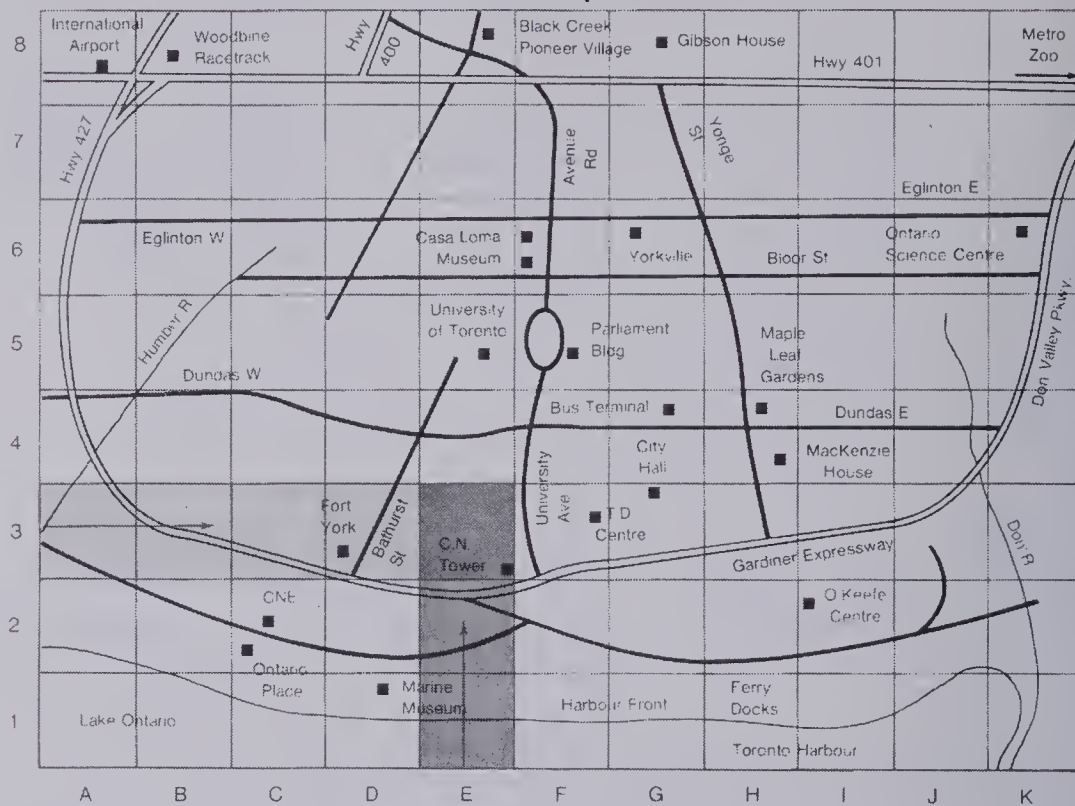
## USING THE BOOK

Discuss the map of Toronto and area. Point out that the grid system has been superimposed on the map to help the reader locate places. Then use the example of the C.N. Tower at (E, 3). Ask what they think E and 3 stand for. [They are names of columns and rows.] After they have located the C.N. Tower, ask them to locate the Parliament Building at (F, 5).

Assign and correct Exercise 1. Ask the pupils to locate the Marine Museum and to write down the ordered pair for its location. [D, 1]

You may wish to do the exercises orally as a class activity then assign the Activity for group work.

## Road Maps



Maps of cities or provinces often have a grid drawn on them in order to help the viewer locate interest points. Refer to the map. The C.N. Tower is located in the square identified by E3.

To find the C.N. Tower:

- Locate E on the horizontal scale. Move upward.
- Locate 3 on the vertical scale. Move to the right.
- Where the two strips intersect, is square E3.
- In this square we easily locate the C.N. Tower.



Exercises

1. Use the ordered pair to locate each.
- |                             |                                      |
|-----------------------------|--------------------------------------|
| (a) Bus Terminal — G4       | (b) Ontario Science Centre — K6      |
| (c) City Hall — G3          | (d) Ontario Place — C2               |
| (e) Casa Loma — F6          | (f) Black Creek Pioneer Village — E8 |
| (g) Woodbine Racetrack — B8 | (h) O'Keefe Centre — I2              |
2. Give the location of each by means of an ordered pair (letter, number).
- |                                   |                            |                           |
|-----------------------------------|----------------------------|---------------------------|
| (a) Parliament Building <b>F5</b> | (b) Airport <b>A8</b>      | (c) Ferry Docks <b>H1</b> |
| (d) Maple Leaf Gardens <b>H4</b>  | (e) Gibson House <b>G8</b> | (f) T.D. Centre <b>F3</b> |
3. An atlas usually has an index. The index is an alphabetical list of cities and places.

Place	Page	Location
London, England	28	C3

Use an atlas and locate these places. Name the country each is in.

- |   |                                |                               |
|---|--------------------------------|-------------------------------|
| (a) Paris <b>France</b>                   | (b) Bangkok <b>Thailand</b>    | (c) Bombay <b>India</b>       |
| (d) Brussels <b>Belgium</b>               | (e) Budapest <b>Hungary</b>    | (f) Moscow <b>U.S.S.R</b>     |
| (g) Tokyo <b>Japan</b>                    | (h) Melbourne <b>Australia</b> | (i) Montevideo <b>Uruguay</b> |
| (j) Capetown <b>Union of South Africa</b> | (k) Peking <b>China</b>        | (l) Istanbul <b>Turkey</b>    |

Activity

Work with a partner.  
Use a large map or atlas.  
Locate and name a place.  
Give the location by means of an ordered pair such as D4.  
Ask your partner to find it.  
Take turns.  
The person locating the most places is the winner.  
Make up your own rules.

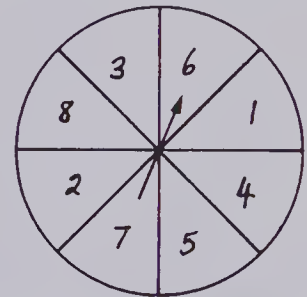


Locating points on a map 193

## ACTIVITIES

1. To help maintain skills and become familiar with the intersection of *areas* (verses lines), have the pupils help prepare spinners and grids. A partially completed sample is shown.

Two to five players take turns twirling the spinner twice to yield an ordered pair. Players locate that square, complete the computation, and use the correct answer as a score. The player with the highest score when all have had seven to ten turns is the winner.



Fill in the blanks using whatever facts you wish to reinforce.

8								
7							$12+10$	
6		$3 \times 3$						
5				$25 \div 5$				
4								
3	$8 \div 2$						$6 \times 1$	
2		$26-13$				$5+0$		
1								$3 \times 2$
	1	2	3	4	5	6	7	8

2. Organize a "Map Contest".  
Form two teams. Each player has an atlas. Write the name of a city on the chalkboard. The first player of each team tries to locate the city in the atlas. The first player to do so wins a point for his or her team. A player from the opposing team checks to see that the player is correct. Then assign other cities to subsequent pairs in the teams. The first team to score ten points wins.

## OBJECTIVE

To evaluate achievement of the chapter objectives

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

HMS — DM48.

## USING THE BOOK

Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a large number of students had difficulty with a particular topic or concept.

The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 164).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1, 2	A	165, 166
3	B	168
5	C	178
8	D	185
7	E	191
6	F	191
4	G	170

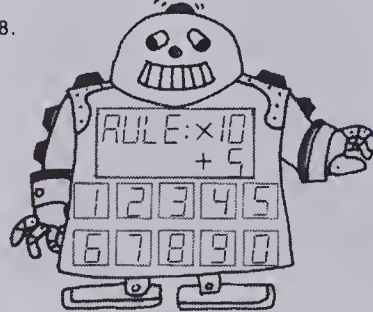
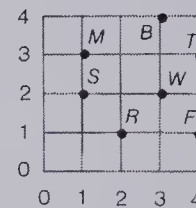
## Chapter Test

- Solve.
  - $6 + \blacksquare = 13$
  - $3 \times T = 15$
  - $14 - 8 = M$
  - $25 \div 5 = \blacksquare$
  - $20 \div N = 10$
  - $\blacksquare + 9 = 16$
- Solve.
  - $N < 3$
  - $5 > T$
  - $17 - 7 > A$
- Graph the solutions on the number line.
  - $4 > B$
  - $N < 1 + 5$
  - $8 + 3 = X$
- Russ Eagle Feathers rode his ten-speed bicycle 17 km altogether on the weekend. On Saturday he rode 7 km. How far did he ride on Sunday?
  - Write a number sentence for the solution.
  - Solve the number sentence.
- Draw a bar graph to show these facts.

Where Immigrants to Canada Came From in 1976.

Britain	36 000	Portugal	16 000
United States	26 000	India	13 000
West Indies	24 000	Hong Kong	13 000

- Write the ordered pair for the point.
  - $M$
  - $F$
- What letter is identified by:
  - $(2, 1)$
  - $(4, 3)$



Rule:

Multiply by 10 and add 5.

Copy and complete the table.

Input	0	1	2	3	5
Output					

5 15 25 35 55

## Cumulative Review

Round to the nearest thousand.

1. 47 300 **47 000** 2. 1180 **1000** 3. 25 500 **26 000** 4. 316 230 **316 000** 5. 69 700 **70 000**

Add.

6. 
$$\begin{array}{r} 34 \\ + 67 \\ \hline 101 \end{array}$$
 7. 
$$\begin{array}{r} 999\ 400 \\ + 123\ 298 \\ \hline 1\ 122\ 698 \end{array}$$
 8. 
$$\begin{array}{r} 3.34 \\ + 1.25 \\ \hline 4.59 \end{array}$$
 9.  $48.3 + 5.77$  **54.07**

Subtract.

10. 
$$\begin{array}{r} 78 \\ - 29 \\ \hline 49 \end{array}$$
 11. 
$$\begin{array}{r} 988\ 005 \\ - 711\ 688 \\ \hline 276\ 317 \end{array}$$
 12. 
$$\begin{array}{r} 18.35 \\ - 9.41 \\ \hline 8.94 \end{array}$$
 13.  $57.34 - 6.7$  **50.64**

Multiply.

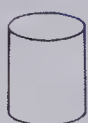
14. 
$$\begin{array}{r} 24.56 \\ \times 0.3 \\ \hline 7.368 \end{array}$$
 15. 
$$\begin{array}{r} 234 \\ \times 0.01 \\ \hline 2.34 \end{array}$$
 16. 
$$\begin{array}{r} 638 \\ \times 45 \\ \hline 28\ 710 \end{array}$$
 17.  $23 \times 1000$  **23 000**

Divide.

18.  $9 \overline{)176}$  **19 R5** 19.  $26 \overline{)783}$  **30 R3** 20.  $64 \overline{)8391}$  **131 R7** 21.  $234 \div 100$  **2.34**

22. Match.

- (a) cone (iii)  
(b) pyramid (iv)  
(c) sphere (ii)  
(d) cylinder (i)



(i)



(ii)



(iii)

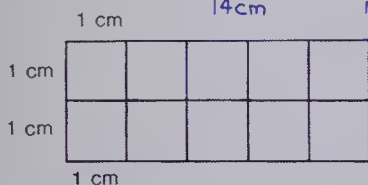


(iv)

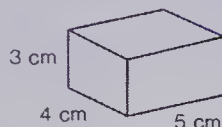
23. How many minutes past 12:00?  
**70 min**



24. Find the (a) perimeter **14 cm** (b) area **10 cm<sup>2</sup>**



25. Calculate the volume. **60 cm<sup>3</sup>**



## OBJECTIVE

To review and test selected concepts and skills previously covered

## PACING

Level A All  
Level B All  
Level C All

## USING THE BOOK

This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a large number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic or, refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1-5	27
6, 10	3
7, 11	21
8, 9, 12, 13	12
14	94
15	109
16	86
17	70
18-20	145
21	108
22	37
23	126
24	155
25	160



# CHAPTER 7 OVERVIEW

This chapter introduces and develops the concepts of properties of addition, multiplication, division, divisibility, factors, prime and composite numbers, multiples, exponents, and problem solving.

## OBJECTIVES

- A To provide practice in working with properties of addition, multiplication, and division
- B To introduce the concept of divisibility and to determine if a number is divisible by 2, 3, 4, 5, 9, or 10
- C To introduce the concept of a factor and to provide practice in working with factors, common factors, greatest common factors, and factor trees
- D To develop the concepts of prime and composite numbers
- E To introduce the concept of multiples and to provide practice in working with multiples, common multiples, and least common multiples
- F To introduce the concept of exponents

## BACKGROUND

As the chapter title "Number Theory" implies, the intent of the next 30 pages is to explore numbers, the properties of numbers, and some of the things that can be accomplished with a familiarity with basic number theory.

This may well be the students' initiation into some of the finer points of number theory. Whereas earlier experiences were limited primarily to using numbers to name quantities in (and of) groups, these pages represent a movement towards dealing with numbers in abstraction. Instead of using an example such as: "A group of twenty-four oranges divided into groups of twelve will give two groups." to show a specific division fact, we will extend such an example to yield generalizations such as:

$$\begin{array}{r} 2 \\ 12 \overline{)24} \end{array}$$

(a) 24 is divisible by 12.

Conclusions such as this can be confusing if they are handled improperly. Move slowly through the topics, yet not so slowly as to lose momentum and thereby overly complicate the task. Use concrete materials to introduce ideas whenever possible and follow that introduction quickly with numerous chalk-board and orally completed examples. Constantly remind the students what they are doing and give them plenty of opportunity to verbalize what various expressions and exercises mean.

### Examples

$10^2$  is simply another way of writing 100.

27 is divisible by 3 because, when 3 is divided into it, there is no remainder; it divides evenly.

$3 \times 16$  is the same as  $(3 \times 10) + (3 \times 6)$  because 16 is the same as  $10 + 6$ .

Use games and student-centred activities to provide practice and to reinforce the lessons. Get the

pupils involved in the preparation of the various materials required for the games. This will provide further opportunity to discuss what is needed, why it is needed, and how it can be used.

Above all, keep all lessons concise and simple. Expressions such as "least common factor", "a number expressed as a product of primes", "the associative property of multiplication", and numerous others used in this chapter will sound complicated and incomprehensible to many if they are introduced too quickly and out of context. Stress the simplicity of the topics, provide plenty of reinforcement (don't forget the Extra Practice, pages 338 and 339 of the student's text) and, if necessary, divide up these number theory topics by interspersing them among lessons which review previous material and recall successful experiences.

## MATERIALS

flash cards	coloured circles
toothpicks	animal pictures
centimetre cubes	newspapers
counting devices such as bottle caps	

## CAREER AWARENESS

### Industrial Designer [204]

Industrial designers have varied backgrounds: some are schooled or trained in the field of art; others are engineers with extensive mathematical and/or scientific training from universities or technical institutions. Most have training in drafting.

One of the jobs of an industrial designer is to design the packages in which products will be placed for shipment, display, and sale. These packages must be attractive as well as protective of the product. Often, the package must convey to the customer the impression that it is a useful product, how it is to be used, and any safety precautions. The package must not be too expensive in comparison to the cost of the object itself.

Some industrial designers work with the design of the product itself. Often they ensure that the product is attractive, safe, and not unduly cumbersome, heavy, or otherwise impractical. They must have knowledge of a wide range of materials in order to select the best material for the product or its package.

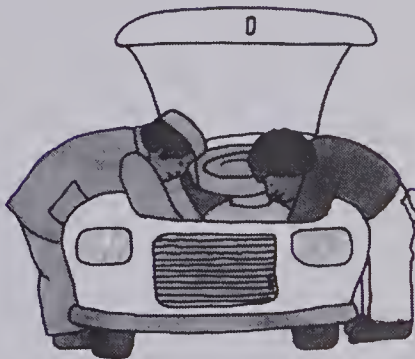
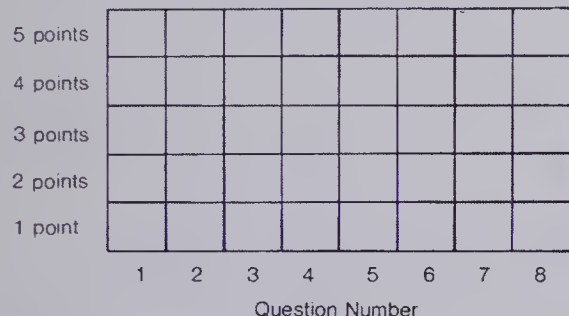
A concern of an industrial designer is the shape of the product or its package. Since shipping is often a major cost of a product, choosing a shape to ensure minimal volume at least cost is important. Also, stacking the product in a warehouse or on shelves for the consumer is an important aspect. What shapes are best for this has to be considered.

The working conditions for an industrial designer are usually very good in that they work in an office and usually for normal-length work days.

## Tune Up

1. (a)  $3 \times 7 = 21$  (b)  $9 \times 6 = 54$  (c)  $8 \times 4 = 32$  (d)  $5 \times 9 = 45$  (e)  $9 \times 9 = 81$
2. (a)  $\begin{array}{r} 34 \\ \times 3 \\ \hline 102 \end{array}$  (b)  $\begin{array}{r} 46 \\ \times 6 \\ \hline 276 \end{array}$  (c)  $\begin{array}{r} 19 \\ \times 7 \\ \hline 133 \end{array}$  (d)  $\begin{array}{r} 88 \\ \times 5 \\ \hline 440 \end{array}$  (e)  $\begin{array}{r} 76 \\ \times 9 \\ \hline 684 \end{array}$
3. (a)  $30 \times 70 = 2100$  (b)  $800 \times 60 = 48000$  (c)  $700 \times 200 = 140000$  (d)  $271 \times 10 = 2710$  (e)  $375 \times 100 = 37500$
4. (a)  $\begin{array}{r} \$8.53 \\ \times 9 \\ \hline \$76.77 \end{array}$  (b)  $\begin{array}{r} \$13.72 \\ \times 6 \\ \hline \$82.32 \end{array}$  (c)  $\begin{array}{r} \$57.04 \\ \times 8 \\ \hline \$456.32 \end{array}$  (d)  $\begin{array}{r} \$628.15 \\ \times 7 \\ \hline \$4397.05 \end{array}$  (e)  $\begin{array}{r} \$198.35 \\ \times 4 \\ \hline \$793.40 \end{array}$
5. (a)  $36 \div 4 = 9$  (b)  $49 \div 7 = 7$  (c)  $28 \div 4 = 7$  (d)  $72 \div 8 = 9$  (e)  $54 \div 9 = 6$
6. (a)  $10 \overline{)230}$  (b)  $10 \overline{)700}$  (c)  $100 \overline{)8000}$  (d)  $100 \overline{)1000}$  (e)  $1000 \overline{)9000}$
7. (a)  $4 \overline{)316}$  (b)  $9 \overline{)405}$  (c)  $8 \overline{)704}$  (d)  $5 \overline{)285}$  (e)  $7 \overline{)462}$
8. (a)  $9 \overline{)4631}$  (b)  $4 \overline{)6375}$  (c)  $6 \overline{)7000}$  (d)  $2 \overline{)4871}$  (e)  $3 \overline{)6890}$

Copy the grid and make a bar graph of your results.  
Each correct answer is worth 1 point.



Drill multiplication and division 197

## OBJECTIVE

To review multiplication and division facts

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

flash cards

## SUGGESTIONS

**Initial Activity** Review multiplication and division facts by using flash cards or any other drill device. On the chalkboard, write the following examples.

$$\begin{array}{r} 47 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 4 \overline{)219} \end{array}$$

Work the examples on the board.

## USING THE BOOK

Ask the students to forecast the number of questions they will answer correctly. At the end of the assignment, they can compare their forecast with their actual achievement.

Students should be encouraged to write only the answers wherever possible.

You may wish to provide 1 cm graph paper so that the students can graph their results.

If students have difficulties with some of these exercises, you may wish to provide remediation. The following chart indicates where the various topics were presented in the text.

Exercise	Page
1	69
2	73
3	70, 71, 84
4	79
5	101
6	107
7	104
8	145

## ACTIVITIES

1. The numbers on the outside ring are multiplied by the number in the centre. Using a pointer, point to 8. Students respond "48". After sufficient practice, change the number in the centre to give practice in all tables.

	8		16	
		8		64
2			72	40
	1			÷8
		56		24
3			0	48
	4		32	
	×6			
0				
	6			
7				
	9			
	5			

2. The numbers on the outside ring are divided by the number in the centre. Point to 16. Students respond "2". Point to 40. Students respond "5", and so on. Change the number in the centre to cover all tables. Numbers on the outside can also be changed so that the answer is not always even.

3. This game can be played by small groups. Two piles of cards are needed. One pile contains numbers from 1 to 9. The second pile contains numbers from 9 to 100. These cards are shuffled and the operation, multiplication or division, is decided. Player 1 takes the top card off each pile and if the operation is division, divides the larger number by the smaller number. If the answer is correct, a point is scored and the next player takes a turn. The player with the most points at the end of a given time limit wins.



## OBJECTIVE

To provide practice in working with properties of addition

## PACING

Level A 1-11  
Level B All  
Level C All

## VOCABULARY

property, commutative, associative

## MATERIALS

toothpicks

## BACKGROUND

Commutative property

$$a + b = b + a$$

Associative property

$$(a + b) + c = a + (b + c) = (a + c) + b$$

The associative property is based on the fact that addition is a binary operation, i.e., it can be performed on only two numbers at a time. The identity element for addition is zero. The sum of any number and zero is the number itself.

## SUGGESTIONS

**Initial Activity** Distribute a number of toothpicks to each student. Ask them to make a bundle of 4 toothpicks. Then they make another bundle of 3 toothpicks. Ask: "How many toothpicks altogether?" [7] Start afresh. Make a bundle of 3 toothpicks. Make another bundle of 4 toothpicks. Ask: "How many toothpicks altogether?" [7] Ask: "To get the sum of two numbers, does it make any difference what number comes first?" [No] Inform the pupils that this property of addition is called the "commutative property".

Following the same procedure, work with bundles of toothpicks and lead students to discover the associative property and the identity property of zero in addition.

## USING THE BOOK

Read through the pupil display at the top of the page together to consolidate the students' understanding of the three properties.

Do Exercises 1, 3, and 5 orally with the students. Assign the rest of the exercises for independent work.

## ACTIVITIES

1. Have the students each draw a diagram showing the commutative property of addition.

2. Have the students each draw a

### Properties of Addition

#### Commutative Property

We can change the order of addends and *not* change the sum.

#### Associative Property

We can change the grouping of the addends and *not* change the sum.

#### Property of Zero

When we add zero to a number the sum is the number.

#### Examples of the properties

$4 + 3 = 7$	$156 + 203 = 359$
$3 + 4 = 7$	$203 + 156 = 359$
$(3 + 4) + 5 = 12$	$215 + (7 + 115) = 337$
$3 + (4 + 5) = 12$	$(215 + 7) + 115 = 337$
$3 + 0 = 3$	$891 + 0 = 891$
$0 + 7 = 7$	$0 + 793 = 793$

#### Exercises

Calculate.

1. $4 + 6 = N$ <b>10</b> $6 + 4 = N$ <b>10</b> Is $4 + 6 = 6 + 4$ ? <b>Yes</b>	2. $531 + 291 = N$ <b>822</b> $291 + 531 = N$ <b>822</b> Is $531 + 291 = 291 + 531$ ? <b>Yes</b>
3. $(3 + 7) + 9 = N$ <b>19</b> $3 + (7 + 9) = N$ <b>19</b> Is $(3 + 7) + 9 = 3 + (7 + 9)$ ? <b>Yes</b>	4. $(631 + 25) + 746 = N$ <b>1402</b> $631 + (25 + 746) = N$ <b>1402</b> Is $(631 + 25) + 746 = 631 + (25 + 746)$ ? <b>Yes</b>
5. $0 + 9 = N$ <b>9</b> $18 + 0 = N$ <b>18</b>	6. $754 + 0 = N$ <b>754</b> $0 + 6375 = N$ <b>6375</b>

Complete.

7. $13 + 15 = 15 + \blacksquare$ <b>13</b>	8. $(395 + 521) + 674 = 395 + (\blacksquare + \blacktriangle)$ <b>521 674</b>
9. $7\ 358\ 203 + 0 = \blacksquare\ 7\ 358\ 203$	10. $0 + 635\ 468 = \blacksquare\ 635\ 468$

11. Can you write a zero property for subtraction? (Hint:  $7 - 0 = 7$ )  
**When we subtract zero from a number the difference is the number.**

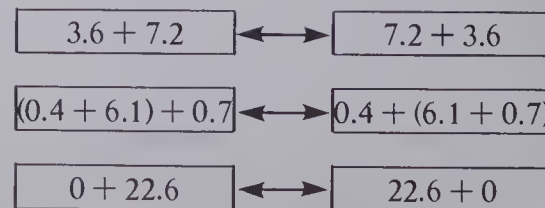
★ 12. Is there a commutative property for subtraction? (Hint: Is  $6 - 5 = 5 - 6$ ?) **No**

★ 13. Is there an associative property for subtraction? (Hint: Is  $7 - (3 - 2) = (7 - 3) - 2$ ?) **No**

diagram showing the associative property of addition.

3. Have the students each draw a diagram showing the zero property of addition.

4. Have the students play "Concentration" as described in the Activity Reservoir. Have them help make pairs of game cards such as these.





## Using Addition Properties

### Associative Property

$$\begin{aligned}(6 + 5) + 4 &= 6 + (5 + 4) \\ &= 6 + 9 \\ &= 15\end{aligned}$$

Add by using grouping.

$$\begin{aligned}23 + 54 &= 23 + (50 + 4) \\ &= (23 + 50) + 4 \\ &= 73 + 4 \\ &= 77\end{aligned}$$

### Commutative Property

$$3 + 4 = 4 + 3$$

$$\begin{aligned}\text{Add: } 17 + 4 + 3 + 16 &= 17 + 3 + 4 + 16 \\ &= 20 + 20 \\ &= 40\end{aligned}$$

### Exercises

Copy and complete.

$$\begin{aligned}1. \quad 52 + 64 &= 52 + (60 + \blacksquare) \\ &= (52 + \blacktriangle 60) + \blacksquare 4 \\ &= \blacktriangledown 2 + \blacksquare 4 \\ &= \bullet 116\end{aligned}$$

$$\begin{aligned}2. \quad 78 + 98 &= 78 + (\blacktriangle 90 + \blacksquare 8) \\ &= (78 + \blacktriangle 90) + \blacksquare 8 \\ &= \blacktriangledown 68 + \blacksquare 8 \\ &= \bullet 176\end{aligned}$$

Add.

3. $53 + 82$	4. $223 + 84$	5. $556 + 88$	6. $479 + 21$	7. $576 + 79$
$\begin{array}{r} 135 \\ 23 + 8 + 7 + 32 \end{array}$	$\begin{array}{r} 307 \\ 223 + 84 \end{array}$	$\begin{array}{r} 644 \\ 556 + 88 \end{array}$	$\begin{array}{r} 500 \\ 479 + 21 \end{array}$	$\begin{array}{r} 655 \\ 576 + 79 \end{array}$
8. $\begin{array}{r} 70 \\ 23 + 8 + 7 + 32 \end{array}$	9. $\begin{array}{r} 307 \\ 470 + 27 + 30 + 123 \end{array}$	10. $\begin{array}{r} 500 \\ 56 + 18 + 14 + 22 \end{array}$		
11. $\begin{array}{r} 3 \\ 4 \\ 7 \\ 6 \\ 5 \\ 3 \\ + 5 \\ \hline 33 \end{array}$	12. $\begin{array}{r} 26 \\ 22 \\ 34 \\ 18 \\ 14 \\ 18 \\ + 36 \\ \hline 168 \end{array}$	13. $\begin{array}{r} 407 \\ 219 \\ 293 \\ 538 \\ 781 \\ 662 \\ + 117 \\ \hline 3017 \end{array}$	14. $\begin{array}{r} 2316 \\ 4425 \\ 6544 \\ 5665 \\ 6348 \\ + 7722 \\ \hline 33020 \end{array}$	

Practice addition 199

## OBJECTIVE

To provide further practice in the use of the properties of addition

## PACING

Level A All  
Level B All  
Level C A!

## SUGGESTIONS

**Initial Activity** With less able students, you may wish to continue working with the toothpicks in the same manner as described in the previous lesson. If this is not considered necessary, reinforce the students' understanding of the properties of addition by going over some examples of the sort shown in the display at the top of the pupil page.

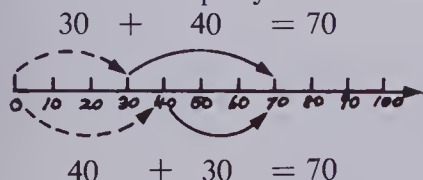
## USING THE BOOK

Do Exercises 1 and 2 on the chalkboard. Have students provide the appropriate numbers to complete the examples. Assign the rest of the page.

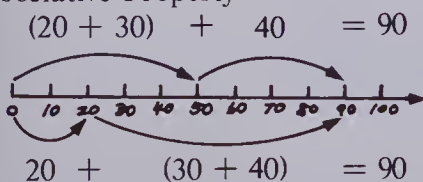
## ACTIVITIES

1. Pupils might enjoy playing "Number Lines". Distribute sheets with several number lines drawn on them. Use the number lines to reinforce the properties.

**Commutative Property**



**Associative Property**



2. Use vertical addition questions to reinforce the commutative property. Ask: "Are the answers the same?"

(a) (i) $\begin{array}{r} 75 \\ + 53 \\ \hline \end{array}$	(ii) $\begin{array}{r} 53 \\ + 75 \\ \hline \end{array}$
(b) (i) $\begin{array}{r} 117 \\ + 40 \\ \hline \end{array}$	(ii) $\begin{array}{r} 40 \\ + 117 \\ \hline \end{array}$

3. Use vertical addition to reinforce the associative property by writing addends in as many ways as possible. Ask: "Are the answers the same?"

(i) $\begin{array}{r} 17 \\ 24 \\ 33 \\ + 45 \\ \hline \end{array}$	(ii) $\begin{array}{r} 33 \\ 17 \\ 24 \\ + 45 \\ \hline \end{array}$
(iii) $\begin{array}{r} 17 \\ 45 \\ 24 \\ + 33 \\ \hline \end{array}$	(iv) $\begin{array}{r} 24 \\ 33 \\ 17 \\ + 45 \\ \hline \end{array}$

## EXTRA PRACTICE

- $365 + (276 + 543) = (365 + \blacksquare) + 543$
- $9847 + 3042 = 3042 + \blacksquare$
- Add each from top to bottom, then bottom to top. Is the answer the same?

(a)  $\begin{array}{r} 84.3 \\ 9.5 \\ 36.4 \\ + 5.3 \\ \hline \end{array}$  [135.5]

(b)  $\begin{array}{r} \$593.24 \\ 48.37 \\ 1.05 \\ + 683.58 \\ \hline \end{array}$  [\$1326.24]

(c)  $\begin{array}{r} 66493 \\ 7682 \\ 449 \\ + 1785 \\ \hline \end{array}$  [76409]

OBJECTIVE

To provide practice in the use of the properties of multiplication

PACING

- Level A All
- Level B All
- Level C All

MATERIALS

toothpicks, centimetre cubes

BACKGROUND

Commutative Property  
 $a \times b = b \times a$   
Associative Property  
 $(a \times b) \times c = a \times (b \times c) = (a \times c) \times b$   
Multiplication is also a binary operation. The identity element in multiplication is one. The product of any number and one is the number itself.

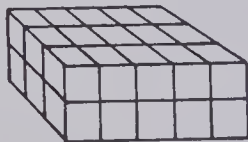
SUGGESTIONS

Initial Activity Use concrete materials such as toothpicks and have the students make an array such as this.



Lead students to see that 3 groups of 4 is the same as 4 groups of 3. This illustrates the commutative property.

To show the associative property, use centimetre cubes to form a solid.



$(5 \times 3) \times 2 = 5 \times (3 \times 2)$   
 $15 \times 2 = 5 \times 6$   
 $30 = 30$

Use toothpicks to show the identity property of one by having students form an array of 7. One group of 7 is 7.

USING THE BOOK

Go over the display information shown at the top of the pupil page to consolidate understanding of the properties.

Do Exercises 1 to 3 orally with the students. Assign the rest of the page.

ACTIVITIES

- Have students draw arrays showing the following.  
(a)  $7 \times 3 = 3 \times 7$   
(b)  $4 \times 6 = 6 \times 4$   
(c)  $3 \times 9 = 9 \times 3$
- Provide centimetre cubes and blank paper. Have the students play "Volume" in pairs. The first player uses the cubes to make a rectangular

Properties of Multiplication

<b>Commutative Property</b> We can change the order of the factors and <i>not</i> change the product.	<i>Examples of the properties</i> $4 \times 5 = 20$ $5 \times 4 = 20$	$11.3 \times 12.3 = 138.99$ $12.3 \times 11.3 = 138.99$
<b>Associative Property</b> We can change the grouping of the factors and <i>not</i> change the product.	$(3 \times 2) \times 7 = 6 \times 7$ $= 42$ $3 \times (2 \times 7) = 3 \times 14$ $= 42$	$(7.4 \times 6) \times 10.2 = 44.4 \times 10.2$ $= 452.88$ $7.4 \times (6 \times 10.2) = 7.4 \times 61.2$ $= 452.88$
<b>Property of 1</b> When we multiply a number by 1 the product is the number.	$8 \times 1 = 8$ $1 \times 19 = 19$	$302 \times 1 = 302$ $1 \times 1976 = 1976$
<b>Property of 0</b> When we multiply a number by 0 the product is 0.	$6 \times 0 = 0$ $0 \times 27 = 0$	$7165 \times 0 = 0$ $0 \times 1\,365\,461 = 0$

Exercises  
Calculate.

1.  $7 \times 9 = N$  63  
 $9 \times 7 = N$  63  
Is  $7 \times 9 = 9 \times 7$ ? Yes

2.  $463 \times 7.2 = N$  3333.6  
 $7.2 \times 463 = N$  3333.6  
Is  $463 \times 7.2 = 7.2 \times 463$ ? Yes

3.  $(9 \times 11) \times 4 = N$  396  
 $9 \times (11 \times 4) = N$  396  
Is  $(9 \times 11) \times 4 = 9 \times (11 \times 4)$ ? Yes

4.  $(7.2 \times 6) \times 11.9 = N$  514.08  
 $7.2 \times (6 \times 11.9) = N$  514.08  
Is  $(7.2 \times 6) \times 11.9 = 7.2 \times (6 \times 11.9)$ ? Yes

5.  $7 \times 1 = \blacksquare$  7  
 $1 \times 9 = \blacksquare$  9

6.  $615\,716 \times 1 = N$  655 716  
 $1 \times 3\,060\,609 = N$  3 060 609

7.  $8 \times 15 = 15 \times \blacksquare$  8

8.  $(6 \times 72) \times 8 = 6 \times (72 \times \blacksquare)$

9.  $8 \times 0 = N$  0

10.  $1\,765\,342 \times 0 = N$  0

prism. The second player calculates the volume in two ways (i.e.,  $(3 \times 4) \times 4$  and  $3 \times (4 \times 4)$ ). Players change roles and score points by giving the correct volume.

3. Have the students help prepare appropriate skill cards in order to play "Dominoes" as described in the Activity Reservoir. Use cards such as these.

$4 \times 5$	$6 \times 7$	$7 \times 6$	0
$83 \times 0$	42	$1 \times 42$	$3 \times 8$

EXTRA PRACTICE

- Complete.
- (a)  $(764 \times 359) \times 100 = 764 \times (\blacksquare \times \blacksquare)$   
[359, 100]  
(b)  $115 \times 0 = N$  [0]  
(c)  $29 \times 36 = 36 \times \blacksquare$  [29]  
(d)  $48 \times 1 = \blacksquare$  [48]  
(e)  $1 \times 175 = \blacksquare$  [175]

## Property Practice

Commutative Property

$$3 \times 2 = 2 \times 3$$

$$\begin{array}{r} 8 \\ \times 6.385 \\ \hline 51.080 \end{array}$$

Associative Property

$$(6 \times 3) \times 5 = 6 \times (3 \times 5) \\ = 6 \times 15$$

We can multiply using grouping of factors.

$$\begin{aligned} 432 \times 42 &= 432 \times (7 \times 6) \\ &= (432 \times 7) \times 6 \\ &= 3024 \times 6 \\ &= 18\,144 \end{aligned}$$

### Exercises

Use the commutative property and multiply.

$$\begin{array}{r} 9 \\ \times 8.34 \\ \hline 75.06 \end{array}$$

$$\begin{array}{r} 8 \\ \times 2.56 \\ \hline 20.48 \end{array}$$

$$\begin{array}{r} 7 \\ \times 0.34 \\ \hline 2.38 \end{array}$$

$$\begin{array}{r} 9 \\ \times 3.546 \\ \hline 31.914 \end{array}$$

$$\begin{array}{r} 6 \\ \times 123.64 \\ \hline 741.84 \end{array}$$

$$\begin{array}{r} 9 \\ \times 191.4 \\ \hline 1722.6 \end{array}$$

$$\begin{array}{r} 4 \\ \times 205.05 \\ \hline 820.20 \end{array}$$

Use factors to multiply.

$$\begin{aligned} 8. \quad 39 \times 24 &= 39 \times (6 \times 4) \\ &= (39 \times 6) \times 4 \\ &= 234 \times 4 \\ &= 936 \end{aligned}$$

$$\begin{aligned} 9. \quad 37 \times 35 &= 37 \times (7 \times 5) \\ &= (37 \times 7) \times 5 \\ &= 259 \times 5 \\ &= 1295 \end{aligned}$$

$$\begin{array}{r} 435 \\ 29 \times 15 \\ \hline 1152 \end{array}$$

$$\begin{array}{r} 992 \\ 31 \times 32 \\ \hline 2430 \end{array}$$

$$\begin{array}{r} 2610 \\ 58 \times 45 \\ \hline 13696 \end{array}$$

$$\begin{array}{r} 2268 \\ 84 \times 27 \\ \hline 32832 \end{array}$$

$$\begin{array}{r} 1134 \\ 63 \times 18 \\ \hline 46848 \end{array}$$

Use both properties.

$$\begin{array}{r} \star 20. \quad 32 \\ \times 8.81 \\ \hline \end{array} \rightarrow \begin{array}{r} 8.81 \\ \times 32 \\ \hline \end{array} \rightarrow \begin{array}{r} 8.81 \\ \times 8 \\ \hline 70.48 \end{array}$$

$$\begin{array}{r} \star 21. \quad 56 \\ \times 6.321 \\ \hline 353.976 \end{array}$$

$$\begin{array}{r} \star 22. \quad 25 \\ \times 16.46 \\ \hline 411.50 \end{array}$$

$$\begin{array}{r} \star 23. \quad 35 \\ \times 23.844 \\ \hline 834.540 \end{array}$$

## OBJECTIVE

To provide practice in working with the properties of multiplication

## PACING

Level A 1-19

Level B 1-19

Level C All

## SUGGESTIONS

**Initial Activity** Use examples like those in the pupil display to show students that multiplication can be made easier by using the commutative and associative properties. Before working with the associative property example, you might have to review the term "factor".

## USING THE BOOK

Do Exercises 1 and 2 on the board with the students. Assign Exercises 3 to 7.

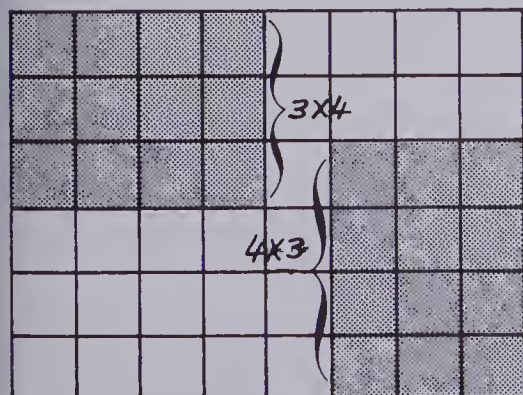
Do Exercises 8 and 9 on the board with the students. Assign Exercises 10 to 19.

Do Exercise 20 on the board with the Level C students. Assign Exercises 21 to 23.

Practice multiplication 201

## ACTIVITIES

1. Distribute squared paper. Have students colour in squares to show that  $3 \times 4 = 4 \times 3$ .



Use other examples such as  $6 \times 2 = 2 \times 6$  and  $8 \times 4 = 4 \times 8$ .

2. Have the students complete this table.

$\times$	1	2	3	4	5	6
1	1	2	3	4		
2	2	4	6			
3	3	6	9			
4						
5						
6						

$$\begin{aligned} 1 \times 1 &= 1 \times 1 \\ 1 \times 2 &= 2 \times 1 \\ 1 \times 3 &= 3 \times 1 \end{aligned}$$

•  
•  
•

3. Play "Bingo" as described in the Activity Reservoir. Have the students randomly fill their blank grids with examples from the chalkboard such as  $7 \times 8$ ,  $4 \times 9$ ,  $3 \times 7$ ,  $0 \times 27$ , etc.

As the "Leader", call out appropriate expressions which

demonstrate the various properties (i.e.,  $8 \times 7$ ,  $9 \times 4$ ,  $7 \times 3$ , 0, etc.).

## EXTRA PRACTICE

Use factors to multiply.

$$\begin{aligned} (a) \quad 42 \times 36 &= 42 \times (3 \times 12) \\ &= (42 \times 3) \times 12 \\ &= 126 \times 12 \\ &= 1512 \end{aligned}$$

$$(b) \quad 76 \times 24 [1824] \quad (c) \quad 63 \times 56 [3528]$$

$$(d) \quad 31 \times 81 [2511] \quad (e) \quad 476 \times 72 [34\,272]$$

$$(f) \quad 852 \times 21 [17\,892]$$

$$(g) \quad 63.4 \times 18 [1141.2]$$



## OBJECTIVE

To provide practice in the use of the properties of division

## PACING

Level A 1-24

Level B 1-24

Level C All

## SUGGESTIONS

**Initial Activity** Have students complete this pattern.

$$2 \div 1 = 2 \quad 3 \div 1 = 3$$

$$4 \div 1 = \blacksquare \quad 7 \div 1 = \blacksquare$$

$$26 \div 1 = \blacksquare \quad 119 \div 1 = \blacksquare$$

Elicit from the students that when a number is divided by 1, the quotient is the same as the original number. Have students complete this pattern.

$$0 \div 1 = 0 \quad 0 \div 2 = 0$$

$$0 \div 3 = \blacksquare \quad 0 \div 9 = \blacksquare$$

$$0 \div 35 = \blacksquare \quad 0 \div 143 = \blacksquare$$

Elicit from the students that when 0 is divided by a number, the quotient is always 0.

## USING THE BOOK

Read Exercises 1 and 2 with the class. Have the students write the appropriate number sentences. In Exercise 3, encourage students to write only the answers wherever possible.

Read Exercises 23, 24, and 25 with the class. You may wish to draw attention to the different units of measurement in Exercise 25, 210 cm and 630 m, and point out the necessity of having to change one so that they are both in the same unit before dividing.

## ACTIVITIES

1. Have students make up problems similar to those in Exercises 1 and 2 to further demonstrate the properties of division.

2. Write  $9 \div 0 = \blacksquare$ . Have students write related multiplication sentences. They then try to replace  $\blacksquare$  with a number that makes the number sentence true. Ask: "Do  $\blacksquare \times 0 = 9$  or  $0 \times \blacksquare = 9$  have solutions?" [No] Ask: "Then does  $9 \div 0 = \blacksquare$  have a solution?" [No]

3. Play "Quad-Row" as described in the Activity Reservoir.

## EXTRA PRACTICE

- (a)  $18 \div 1 = \blacksquare$  (b)  $36 \div 0 = \blacksquare$   
(c)  $0 \div 97 = \blacksquare$  (d)  $5827 \div 1 = \blacksquare$

## Properties of Division

### Property of Zero

- (a) Zero divided by a number is zero.  
(b) Division by zero has no meaning.

### Examples of the properties

$$0 \div 6 = 0 \quad 0 \div 416 = 0$$

$$2 \div 0 \text{ has no meaning.}$$

### Property of 1

When we divide a number by 1 the quotient is the number.

$$3 \div 1 = 3$$

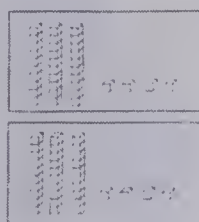
$$647 \div 1 = 647$$

### Exercises

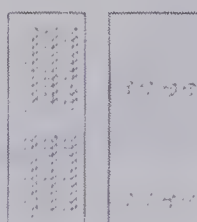
- You have a party. 4 friends come. You share 0 pizzas. How much pizza does each person get? Write a number sentence.  $0 \div 5 = 0$
  - You have a party. But no one comes. You share 2 pizzas. How much pizza do you get? Write a number sentence.  $2 \div 1 = 2$
- Calculate the answer, where possible.
- $20 \div 4 = 5$
  - $6 \div 1 = 6$
  - $7 \div 0$  It has no meaning.
  - $0 \div 9 = 0$
  - $96 \div 6 = 16$
  - $360 \div 31 = 11$  360
  - $0 \div 90 = 0$  03
  - $54 \div 9 = 6$  0.8
  - $64 \div 8 = 8$  2
  - $10 \div 1765$  no meaning.
  - $9 \overline{)279} = 31$  19
  - $41 \overline{)4223} = 103$  801
  - $71 \overline{)00}$  It has no meaning.
  - $6.2 \overline{)124} = 20$  17 956
  - $1 \overline{)1765}$  It has no meaning.
  - $23 \overline{)437} = 19$
  - $64 \overline{)51264} = 801$
  - $0 \overline{)17945}$
  - $1 \overline{)17956}$
  - $0 \overline{)895}$
  - Max had 54.9 mm of silver wire. He cut it into 9 equal pieces for jewellery. How long is each piece?  $6.1 \text{ mm}$
  - Henrietta worked in the garden 210 min altogether. How many hours did she work?  $3.5 \text{ h}$
  - The distance around Jim's bicycle wheel is 210 cm. Jim rode his bicycle 630 m. How many times did the wheel turn?  $300$



# The Distributive Property



2 sets of  $(30 + 4)$   
 $2 \times (30 + 4)$   
 $2 \times 34$   
 68



2 sets of 30 + 2 sets of 4  
 $(2 \times 30) + (2 \times 4)$   
 60 + 8  
 68

$$2 \times (30 + 4) = (2 \times 30) + (2 \times 4)$$

## Exercises

Complete.

1. =   
 $2 \times (30 + 4) = (2 \times 30) + (2 \times 4)$   
 $2 \times 34 = 60 + 8$   
 $68$

2. =   
 $2 \times (30 + 4) = (2 \times 30) + (2 \times 4)$   
 $2 \times 34 = 60 + 8$   
 $68$

3.  $3 \times 12 = 3 \times (10 + 2)$   
 $= (3 \times 10) + (3 \times 2)$   
 $= 30 + 6$   
 $= 36$

4.  $4 \times 23 = 4 \times (20 + 3)$   
 $= (4 \times 20) + (4 \times 3)$   
 $= 80 + 12$   
 $= 92$

5.  $5 \times 26$  130    6.  $7 \times 19$  133    7.  $9 \times 36$  324    8.  $6 \times 43$  258    9.  $8 \times 96$  768  
 10.  $4 \times 412$  1648    11.  $8 \times 109$  872    12.  $7 \times 209$  1463    13.  $8 \times 620$  4960    14.  $6 \times 350$  2100

Distributive property 203

## ACTIVITIES

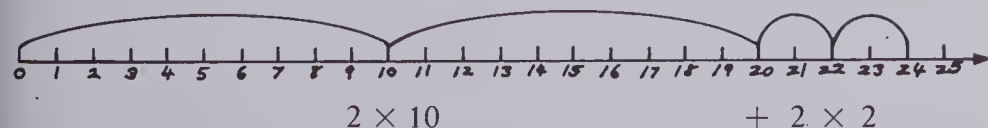
1. Have the students illustrate multiplication expressions using a number line.  
 Example

$$2 \times 12$$

$$2 \times (10 + 2)$$

$$(2 \times 10) + (2 \times 2)$$

$$24$$



Use Exercises 5 to 14 as a source for number lines.

2. Have the students illustrate expressions as in the first activity using squared paper and diagrams.

Squared paper



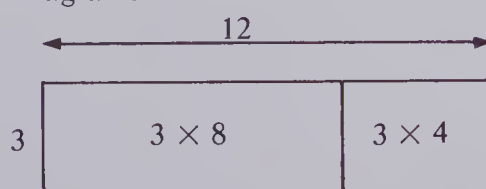
$$3 \times 3 + 3 \times 10$$

$$= 3 \times (3 + 10)$$

$$= 3 \times 13$$

$$= 39$$

Diagrams



$$3 \times (8 + 4) = 3 \times 12$$

$$= 36$$

## EXTRA PRACTICE

- (a)  $8 \times 36$  [288]    (b)  $5 \times 432$  [2160]  
 (c)  $6 \times 78$  [468]    (d)  $8 \times 376$  [3008]  
 (e)  $5 \times 321$  [1605]    (f)  $7 \times 98$  [686]

## OBJECTIVE

To provide practice in working with the distributive property

## PACING

Level A 1-9  
 Level B 1-12  
 Level C All

## VOCABULARY

distributive

## MATERIALS

centimetre cubes

## RELATED AIDS

HMS — DM49.  
 CALC. W/BK — 19.

## BACKGROUND

The distributive property is the foundation of the multiplication algorithm.

$$34 = 30 + 4 = 30 + 4$$

$$\times 2 \quad \times 2 \quad \times 2 \quad \times 2$$

$$= 60 + 8 = 68$$

## SUGGESTIONS

**Initial Activity** Give centimetre cubes to groups of students. Have them arrange the cubes in sets similar to the first one in the display shown at the top of the pupil page. Say: "We have two sets of  $(30 + 4)$  or 2 sets of 34. How many cubes altogether?" [68] Have students arrange cubes in sets similar to the second one in the display. Say: "We will distribute them in a different way from the first time." "This time we have two sets of 30 and two sets of 4." "How many in two sets of 30?" [60] "How many in two sets of 4?" [8] "How many altogether?" [68]

Point out that, no matter which way we arrange them, the total number of cubes remains the same.

## USING THE BOOK

Do Exercise 1 on the board with the students. Have them complete Exercise 2 by themselves. Similarly, do Exercise 3 with the students and have them do Exercise 4 on their own. Do Exercise 5 on the board with the students. When you are sure that the students are familiar with the process, assign the rest of the exercises.

You may wish to remind students to refer to the model in the display at the top of the pupil page if they need a guide.

## OBJECTIVE

To solve word problems

## PACING

Level A All

Level B All

Level C All

## VOCABULARY

industrial designer, recommended

## SUGGESTIONS

**Initial Activity** Ask students if they know anyone who is an industrial designer. Talk about the work of an industrial designer. (See the Career Awareness notes in the Chapter Overview, page 196.) Discuss how he or she must be creative and good at problem solving.

## USING THE BOOK

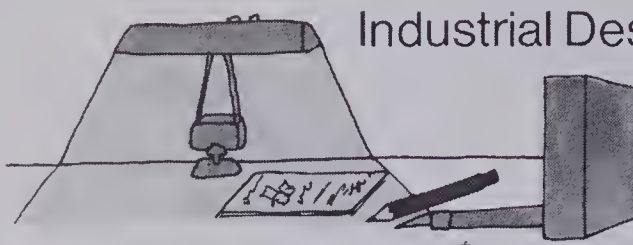
You may wish to read each problem orally with less able students, helping them understand the intent of the problem and also helping them with some of the more difficult words. The others can do the problems by themselves.

## ACTIVITIES

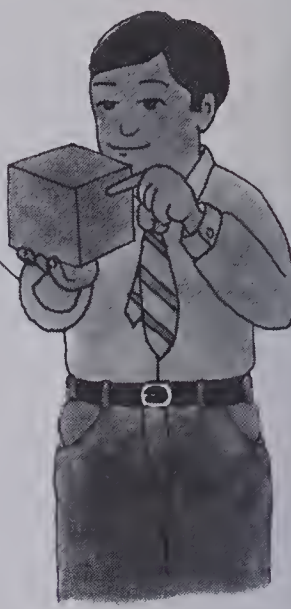
1. Ask the students to bring interesting package types to class (panty hose, clean-up cloths, household cleaners, etc.). Discuss the merits and appeal of each.

2. Ask students to design appropriate and original packaging for some of the following.  
(a) pencils (b) tomatoes (c) golf balls  
(d) skipping ropes (e) perfume (f) hair spray (g) toothpaste (h) detergent

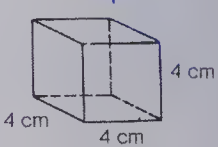
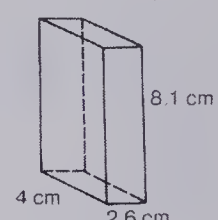
3. Challenge students to design a new, revolutionary product and have them present their designs to the rest of the class.





### Industrial Designer




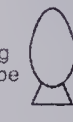
- Ms. Gomez is designing a carton to hold 10 seashells in 2 rows. The largest shell takes a rectangular space 6 cm by 4 cm. What are two sizes of the carton Ms. Gomez can make to hold the shells?  
**8 cm X 30 cm carton or 12 cm X 20 cm carton**
- Mr. Quong is designing a package for soap. If he uses boxes shaped like a cube, each package costs 18¢. If he uses rectangular solid boxes, each package costs 22¢. Mr. Quong recommended the cube. How much would Mr. Quong save his customer who wants 2000 boxes?  
**\$80**
- Mrs. Niblak designs clock faces. She likes the hexagonal (six-sided) face better than the square face. Each hexagonal face costs \$1.33 while each square face costs \$0.86. How much extra would the hexagonal face cost in manufacturing 5000 clocks?  
**\$2350**
- Mr. Erickson is designing a package for a new revolutionary product. Which box has the larger volume?  
**4 cm X 2.6 cm X 8.1 cm box**


- Name some products that would sell well when sold in each shape.

Cube

Hexagonal prism

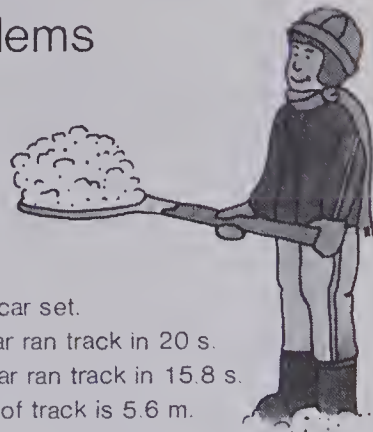
Cylinder

Egg shape



## Make Your Own Problems

For each set of statements write one problem.  
Write the problem on a card.  
Solve your problem.  
Write your answer on the reverse side of the card.  
Exchange cards with classmates.  
Solve 5 of their problems. *Answers will vary.*



- In Manitoba in one year 400 000 000 bottles and cans were recycled.  
Average price paid per container is 5¢.
- A rope is to be cut into skipping ropes.  
Length of rope is 18.6 m.  
There are 6 children.
- 12 cm of snow on Saturday.  
3 cm of snow fell each day Sunday through Wednesday.  
Total snowfall for month was 62 cm.
- Speed car set.  
Red Star ran track in 20 s.  
Blue Star ran track in 15.8 s.  
Length of track is 5.6 m.
- A tanker truck has 18 wheels.  
There are 12 trucks.  
Each truck needs 3 new tires.  
Each tire costs \$252.50.

## BRAINTICKLER

It is said that Euclid gave this problem to his class in Alexandria about 280 B.C.:

A mule and a donkey were loaded down with wheat on their way to market. The mule said to the donkey, "If you give me 1 unit of wheat I will be carrying twice as much as you. If I gave you 1 unit, we would both have equal masses." How many units of wheat was each carrying?

*Mule is carrying 7 units.  
Donkey is carrying 5 units.*

Making your own problems, practice 205

## OBJECTIVES

To create word problems using a given set of facts  
To maintain arithmetic skills

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

reverse

## BACKGROUND

If you have not already done so, see the notes about writing word problems on pages 4, 26, and 90 of the teaching notes.

## SUGGESTIONS

**Initial Activity** Write a set of statements on the board of the sort shown in the exercises on the pupil page. Have students make up a problem incorporating these facts. Write the problem on the board. Solve it and indicate that both the problem and the answer are to be written on a card (with the answer on the back).

## USING THE BOOK

You may wish to read each set of statements orally with less able students. Others can go ahead and do the exercises.

Students who finish the assignment ahead of their classmates can do the Braintickler independently. You may wish to read the Braintickler to less able students and help them with it.

The Tune Up activity can be done in a separate lesson with all students. Ask students to forecast how many questions they think they will answer correctly before they begin.

The following chart shows where each topic was presented in the text.

Exercise	Page
1-3	7
4-6	21
7	73
8	74
9, 10	88
11-13	145
14	139, 141

## Tune Up

Calculate.

- $3 + 4 + 7 + 9 + 16 + 25$  *64*
- $17 + 6 + 7 + 4 + 19 + 22$  *75*
- $371 + 456 + 78 + 5 + 777$  *1687*
- $5678 - 2999$  *2679*
- $700\,008 - 499\,999$  *200\,009*
- $7\,888\,666 - 1\,999\,999$  *5\,888\,667*
- $47 \times 8$  *376*
- $631 \times 8$  *5048*
- $9214 \times 75$  *691\,050*
- $6303 \times 391$  *2\,464\,473*
- $6 \overline{)158}$  *26 R2*
- $7 \overline{)395}$  *56 R3*
- $9 \overline{)1845}$  *205*
- $22 \overline{)79.2}$  *36*

## ACTIVITIES

1. On a bulletin board, display some of the problems created by the students in the Initial Activity.

2. Have each student make up a set of statements similar to the ones in the assignments. Exchange statements with a classmate. The classmate makes up an appropriate problem incorporating these statements but interjects an extra statement which is irrelevant. Exchange the newly-created problem with its irrelevant statement with another classmate who identifies the irrelevant statement and also solves the problem.

OBJECTIVE

To introduce the concept of divisibility

PACING

- Level A All
- Level B All
- Level C All

VOCABULARY

divisibility

MATERIALS

counters, bottle caps, or any other counting device

SUGGESTIONS

**Initial Activity** Distribute counters. Ask students to take 14 counters and divide them evenly into 2 groups of the same size. Ask how many are in each group. [7] Ask how many are left over. [0] Explain that 14 is divisible by 2 because there is no remainder. Repeat the procedure and vary the number of counters and the number of equal-sized groups. Check each time to see if one is divisible by the other.

Go over the display shown at the top of the pupil page to reinforce the concept.

USING THE BOOK

You may wish to do Exercise 1 orally with the students. With less able students, do the first few examples of each question with them before assigning the remaining examples.

ACTIVITIES

1. Make copies of the following divisibility chart. Instruct students to write yes or no in the squares.

	Divisible by 2	Divisible by 3	Divisible by 5	Divisible by 9
36	Yes	Yes	No	Yes
50				
99				
153				
274				
398				
1437				
55 273				

2. "Boom Game". Choose a number such as 6. The class begins to count 1, 2, 3, 4, 5, BOOM, 7, 8, 9, 10,

Divisibility

Grandma Thatchett wanted to divide 18 chocolate chip cookies among her 3 grandchildren. She gave each of them 6 cookies. There were no cookies left.

$$\begin{array}{r} 6 \\ 3 \overline{) 18} \\ \underline{18} \\ 0 \end{array}$$
 18 is divisible by 3.  
0 ← No remainder

$$\begin{array}{r} 6 \\ 3 \overline{) 19} \\ \underline{18} \\ 1 \end{array}$$
 19 is not divisible by 3.  
1 ← Remainder

If there is *no* remainder, the first number is **divisible** by the second number.

Exercises

- Divide to determine which of the following are divisible by 2.  
24 12 35 17 1 72 36 126 63 363 181 1757 378 1800 400  
Yes No Yes Yes No No Yes
- Divide to determine which of the following are divisible by 3.  
33 11 6120 17324 1156 52 270 90 692 230 2 927 309  
Yes No No Yes Yes No Yes
- Divide to determine which of the following are divisible by 4.  
64 16 399 3 124 31 314 78 2508 127 1720 430 1913 478 1  
Yes No Yes No Yes Yes No
- Divide to determine which are divisible by 5.  
459 6312 3515 103 680 136 1751 350 11975 395 12 350 2470  
Yes No Yes Yes No Yes Yes Yes
- Divide to determine which are divisible by 9.  
566 2 637 1571 74 927 103 1512 168 3411 379 76 545 8505  
No Yes No Yes Yes Yes Yes Yes
- Divide to determine which are divisible by 10.  
707 290 29 40340 3905 90 51600 160 2580 258 96 400 9640  
Yes Yes No No Yes Yes Yes



Activity

Work in pairs. Take turns choosing a number and giving it to your partner to determine if its divisible by one of 2, 3, 4, 5, 9, or 10. (You must be able to tell if your partner is correct.) One point for each correct answer. The player with the most points after 10 plays wins.

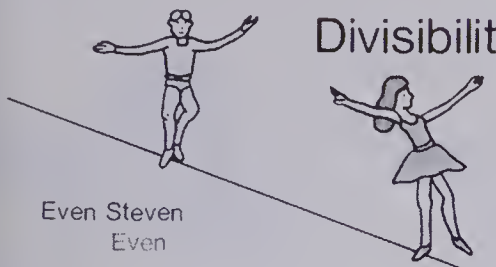
11, BOOM. Whenever they come to a number that is divisible by 6, they say "BOOM" instead of the number. Change the given numbers.

EXTRA PRACTICE

- Using the following numbers:  
6, 14, 8, 40, 13, 27, 36, 217, 70, 344,
- circle all numbers divisible by 4;
  - draw a box around all numbers divisible by 7;
  - draw a line under all numbers divisible by 10.



## Divisibility by 2 and 4



Even Steven

Even

10

42

74

36

298

Odd Maude

Odd

21

53

65

87

39

5

4) 21

20

1

$$\begin{array}{r} 5 \\ 2 \overline{) 10} \\ \underline{10} \\ 0 \end{array}$$

$$\begin{array}{r} 149 \\ 2 \overline{) 298} \\ \underline{2} \\ 09 \\ 8 \\ \underline{18} \\ 18 \\ \underline{18} \\ 0 \end{array}$$

Even numbers are divisible by 2.

The one's digit is either 0, 2, 4, 6, or 8.

$$\begin{array}{r} 54 \\ 4 \overline{) 216} \\ \underline{20} \\ 16 \\ \underline{16} \\ 0 \end{array}$$

$$\begin{array}{r} 127 \\ 4 \overline{) 508} \\ \underline{4} \\ 10 \\ \underline{8} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

$$\begin{array}{r} 431 \\ 4 \overline{) 1724} \\ \underline{16} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

$$\begin{array}{r} 112 \\ 4 \overline{) 448} \\ \underline{4} \\ 04 \\ \underline{4} \\ 08 \\ \underline{08} \\ 0 \end{array}$$

$$\begin{array}{r} 428 \\ 4 \overline{) 1712} \\ \underline{16} \\ 11 \\ \underline{8} \\ 32 \\ \underline{32} \\ 0 \end{array}$$

$$\begin{array}{r} 1250 \\ 4 \overline{) 5000} \\ \underline{4} \\ 10 \\ \underline{8} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

The numbers 216, 508, 1724, 448, 1712, and 5000 are divisible by 4.

The last two digits in each number are divisible by 4.

A number is divisible by 4 if the last 2 digits are divisible by 4.

### Exercises

- List each number as even or odd.  
8, 9, 18, 29, 61, 84, 137, 840, 945, 348, 952, 156, 3599, 4614, 6407, 6532, 6843.

Even	Odd
8	9

- Which numbers are divisible by 2?  
1260, 7183, 6666, 855, 2768, 9969.
- Count by 4's from 480 to 512.  
Are the last two digits in each number divisible by 4? **Yes**  
Are all the numbers divisible by 4? **Yes**

## OBJECTIVE

To determine if a number is divisible by 2 or 4 using a short method

## PACING

Level A All

Level B All

Level C All

## RELATED AIDS

CALC. W/BK — 28.

## SUGGESTIONS

**Initial Activity** Have the students count by 2's. Elicit from them that the even numbers are 0, 2, 4, 6, and 8. Elicit from the students that the odd numbers are 1, 3, 5, 7, and 9.

Study the display at the top of the pupil page. Consolidate the idea that even numbers are divisible by 2 because there is no remainder. Odd numbers are not divisible by 2 because there *is* and always will be a remainder.

## USING THE BOOK

You may wish to do the first few numbers in Exercise 1 with less able students. Encourage students to determine divisibility by using the short method rather than by dividing out each example.

## ACTIVITIES

1. Make copies of a 10 by 10 grid with the squares numbered 1 to 100. Have students colour the numbers that are divisible by 2 in blue and the numbers divisible by 4 in yellow. Many squares will be green because of the mixing of blue and yellow. This should be brought to the students' attention.

2. Play "Tic Tac Toe" with an expanded grid. Students write in numbers between 2 and 100 that are divisible by 2 and/or 4. As a student calls out numbers at random that are divisible by 2 and/or 4, students check off their numbers. The first one to get 5 in a row wins.

3. Choose 6 students. They each write down 5 numbers between 2 and 100 that are divisible by 2 and/or 4. The students line up in a row at the back of the classroom. A seventh student stands at the front of the room with his or her back turned to the other 6. This student calls a number divisible by 2 or 4. If it is a number that has been chosen by any of the 6, they take a giant step forward. The first student to reach and touch the caller wins.

### ANSWERS:

Even  
1. 18, 84, 840, 348, 952, 156, 4614, 6532

2. 1260, 6666, 2768

3. 480, 484, 488, 492, 496, 500, 504, 508, 512

Odd  
29, 61, 137, 945, 3599, 6407, 6843



## OBJECTIVE

To determine if a number is divisible by 5 or 10 by using a short method

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

CALC. W/BK — 29.

## SUGGESTIONS

**Initial Activity** Write the numbers 50 through 80 on the board. Assign a number to each student in your class. Have them divide their number by 5. Ask students whose number is divisible by 5 to circle the number on the board. Draw attention to the one's digit in each of these numbers. Elicit from the students that the numbers with 0 or 5 in the one's digit are divisible by 5. Repeat this procedure for 10.

## USING THE BOOK

You may wish to do Exercises 1 and 3 orally with the class. In Exercises 5 and 6, you may wish to identify the first numbers that are divisible with the class.

## ACTIVITIES

1. Make a deck of 50 cards with numbers larger than 100. Students play in pairs. The cards are dealt out evenly so that each player has 25 cards. The first player places his or her top card face up in the middle. If it is not divisible by 5, then the second player plays a card, placing it on top of the card in the middle. If it is divisible by 5, the first player who calls "yes" takes the cards in the middle. The game begins again. The first player to take all the cards from the opponent wins.

2. The same game as above can be played by identifying the cards divisible by 10.

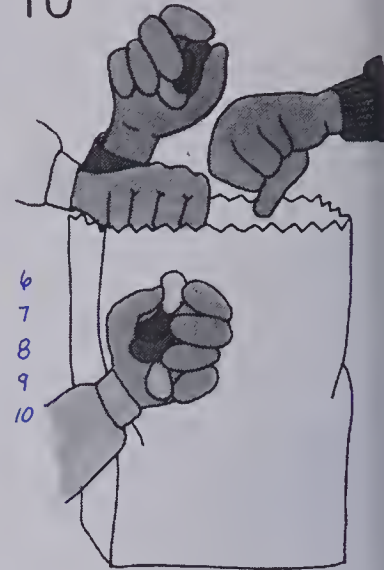
3. See "Quad-Row" (Variation 2) as described in the Activity Reservoir.

## EXTRA PRACTICE

In this list of numbers, which ones are not divisible by 5 or 10?

153, 276, 850, 36, 55, 90, 72, 467, 670, 26, 85, 10

## Divisibility by 5 and 10



1. Copy and complete. Examine the one's digit in each.

$$\underline{5} \div 5 = 1$$

$$\underline{10} \div 5 = 2$$

$$\underline{15} \div 5 = 3$$

$$\underline{20} \div 5 = \blacksquare 4$$

$$\underline{25} \div 5 = \blacksquare 5$$

$$\underline{30} \div 5 = \blacksquare 6$$

$$\underline{35} \div 5 = \blacksquare 7$$

$$\underline{40} \div 5 = \blacksquare 8$$

$$\underline{45} \div 5 = \blacksquare 9$$

$$\underline{50} \div 5 = \blacksquare 10$$

2. Copy and complete.

A number is divisible by 5 if the one's digit is  $\blacksquare 5$  or  $\blacksquare 0$ .

3. Copy and complete. Examine the one's digit in each.

$$\underline{10} \div 10 = 1$$

$$\underline{20} \div 10 = 2$$

$$\underline{30} \div 10 = \blacksquare 3$$

$$\underline{40} \div 10 = \blacksquare 4$$

$$\underline{50} \div 10 = \blacksquare 5$$

$$\underline{60} \div 10 = \blacksquare 6$$

$$\underline{70} \div 10 = \blacksquare 7$$

$$\underline{80} \div 10 = \blacksquare 8$$

$$\underline{90} \div 10 = \blacksquare 9$$

$$\underline{100} \div 10 = \blacksquare 10$$

4. Copy and complete.

A number is divisible by 10 if the one's digit is  $\blacksquare 0$ .

5. Copy these numbers. Draw a circle around each number divisible by 5.

16, 25, 30, 24, 87, 115, 2, 70, 221, 75, 360, 478.

6. Copy these numbers. Draw a square around each number divisible by 10.

60, 32, 100, 213, 400, 680, 39, 518, 950, 76, 340, 1000.

7. Write three numbers greater than 100 that are divisible by 5.

Three answers are 105, 110, 115.

8. Write three numbers greater than 200 that are divisible by 10.

Three answers are 210, 220, 230.

## Divisibility by 3 and 9

$$\begin{array}{r} 849 \\ 3 \overline{) 2547} \rightarrow 2547 \rightarrow 2 + 5 + 4 + 7 = 18 \\ 24 \\ \hline 14 \\ 12 \\ \hline 27 \\ 27 \\ \hline 0 \end{array}$$

Add the digits.  
18 is divisible by 3.  
2547 is divisible by 3.

$$\begin{array}{r} 5282 \\ 9 \overline{) 47538} \rightarrow 47538 \rightarrow 4 + 7 + 5 + 3 + 8 = 27 \\ 45 \\ \hline 25 \\ 18 \\ \hline 73 \\ 72 \\ \hline 18 \\ 18 \\ \hline 0 \end{array}$$

Add the digits.  
27 is divisible by 9.  
47 538 is divisible by 9.

**Exercises** 93, 96, 99, 102, 105, 108, 111, 114, 117, 120, 123, 126, 129

- (a) Count by 3's from 93 to 129. Write the numbers.  
(b) Add the digits in each number. Is the sum in each divisible by 3? **Yes**  
Add the digits.  
 $93 \rightarrow 9 + 3 = 12$  12 is divisible by 3.  
 $96 \rightarrow 9 + 6 = 15$  15 is divisible by 3.  
(c) Is each number divisible by 3? **Yes** (d) Write a rule for finding numbers divisible by 3.  
*A number is divisible by 3 if the sum of its digits is divisible by 3.*
- Which of the following are divisible by 3?  
234 331 4563 453 912 415 553
- (a) Count by 9's from 81 to 162. Write the numbers. *81, 90, 99, 108, 117, 126, 135, 144, 153, 162*  
(b) Add the digits in each number. Is the sum in each divisible by 9? **Yes**  
Add the digits.  
 $81 \rightarrow 8 + 1 = 9$  9 is divisible by 9.  
 $90 \rightarrow 9 + 0 = 9$  9 is divisible by 9.  
(c) Is each number divisible by 9? (d) Write a rule for finding numbers divisible by 9.  
*A number is divisible by 9 if the sum of its digits is divisible by 9.*
- Which of these numbers are divisible by 9? **Yes**  
56 63 157 927 1512 76 545

Divisibility by 3 and 9 209

## OBJECTIVE

To determine if a number is divisible by 3 or 9 by using a short method

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

CALC. W/BK — 58.

## SUGGESTIONS

**Initial Activity** Tell students that you can very quickly determine if a number is divisible by 3 without dividing. Ask students to challenge you with a 4-digit number. Write the number on the board. Apply the short method outlined in the pupil display. Only write the sum of the digits beside the number. Then tell whether the number is divisible by 3. Repeat with different numbers. Have students try to work out what method you are using.

Repeat the procedure for divisibility by 9.

## USING THE BOOK

In Exercises 2 and 4, have students employ the short method to determine divisibility. The more able students who finish the assignment quickly could divide out the examples by 3 and 9 to provide further "proof" that the short method works.

ANSWERS:

1. (b)  $99 \rightarrow 9 + 9 = 18$ ;  $102 \rightarrow 1 + 0 + 2 = 3$ ;  $105 \rightarrow 1 + 0 + 5 = 6$ ;  $108 \rightarrow 1 + 0 + 8 = 9$ ;  $111 \rightarrow 1 + 1 + 1 = 3$ ;  $114 \rightarrow 1 + 1 + 4 = 6$ ;  $117 \rightarrow 1 + 1 + 7 = 9$ ;  $120 \rightarrow 1 + 2 + 0 = 3$ ;  $123 \rightarrow 1 + 2 + 3 = 6$ ;  $126 \rightarrow 1 + 2 + 6 = 9$ ;  $129 \rightarrow 1 + 2 + 9 = 12$   
3. (b)  $99 \rightarrow 9 + 9 = 18$ ;  $108 \rightarrow 1 + 0 + 8 = 9$ ;  $117 \rightarrow 1 + 1 + 7 = 9$ ;  $126 \rightarrow 1 + 2 + 6 = 9$ ;  $135 \rightarrow 1 + 3 + 5 = 9$ ;  $144 \rightarrow 1 + 4 + 4 = 9$ ;  $153 \rightarrow 1 + 3 + 5 = 9$ ;  $162 \rightarrow 1 + 6 + 2 = 9$

## ACTIVITIES

- Play the card game described in Activity 1 in the previous lesson.
- Students take turns counting beginning with 1. When a number divisible by 3 or 9 is reached, the word "Div" is said instead of the number, e.g., 1, 2, DIV, 4, 5, DIV, 7, 8, DIV, etc.
- Students play in pairs with three dice. Each takes a turn and rolls the three dice, three times. They total the numbers rolled. If the total comes to a number divisible by 3 or 9, the player wins a point. For example, the first roll yields  $\begin{array}{|c|c|c|} \hline \cdot & \cdot & \cdot \\ \hline \end{array} + \begin{array}{|c|} \hline \cdot \\ \hline \end{array} + \begin{array}{|c|c|} \hline \cdot & \cdot \\ \hline \end{array} = 12$ . The second roll  $\begin{array}{|c|} \hline \cdot \\ \hline \end{array} + \begin{array}{|c|c|} \hline \cdot & \cdot \\ \hline \end{array} + \begin{array}{|c|c|} \hline \cdot & \cdot \\ \hline \end{array} = 10$ .

The third roll  $\begin{array}{|c|c|} \hline \cdot & \cdot \\ \hline \end{array} + \begin{array}{|c|c|} \hline \cdot & \cdot \\ \hline \end{array} + \begin{array}{|c|c|c|} \hline \cdot & \cdot & \cdot \\ \hline \end{array} = 14$ .

A total of 36 wins the point.

4. See "Quad-Row" (Variation 2) as described in the Activity Reservoir.

## EXTRA PRACTICE

1. Which of these numbers is divisible by 3?

462, 976, 44 532, 7615, 48 291, 66 666

2. Which of these numbers is divisible by 9?

35, 479, 63 420, 57 278, 99 469, 35 418, 11 111 111

OBJECTIVE

To introduce the concept of a factor

PACING

- Level A All
- Level B All
- Level C All

VOCABULARY

factor

MATERIALS

cardboard, overhead projector (optional)

BACKGROUND

The term “factor” means the number of equal groups and also the number of items in each of these groups.

SUGGESTIONS

**Initial Activity** Since this activity page involves the manipulation of concrete materials, you may wish to simply complete the page together and discuss the instructions and responses orally. (See Using the Book.)

Since this page involves the use of concrete materials and requires students to manipulate the material to arrive at an understanding of a factor, the Initial Activity and Using the Book sections can be combined.

USING THE BOOK

Read through the instructions on the pupil page and complete the page as a group activity. You may wish to prepare and distribute a sheet on which the various factor bars have been drawn. The pupils can use these as a template for making their own bar set.

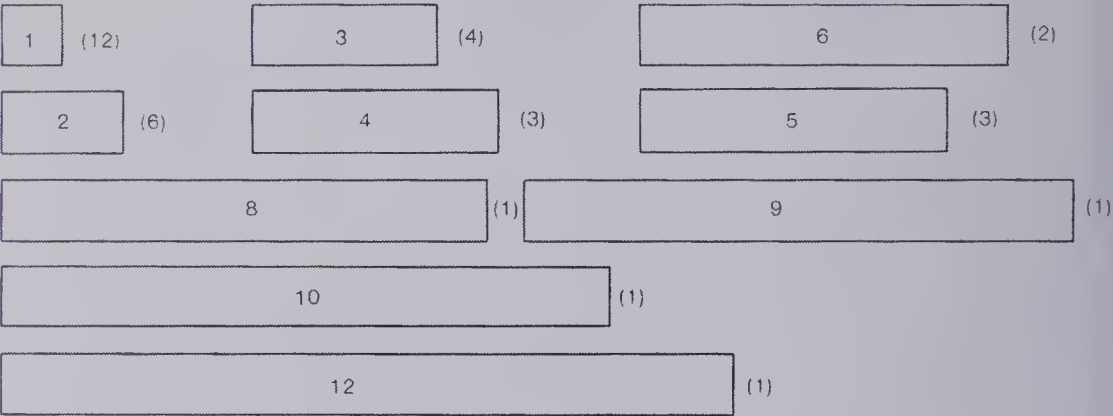
When each pupil has a set of bars, read through the exercises together. Have the pupils work at their desks while you demonstrate using a set of bars on the chalkboard or overhead projector.

Be sure to list the factors for each number that is factored and point out the relationship between the numbers in the factor list and the factor bars which were used.

As you work through each example, stress that (a) each original bar must be covered *exactly* using factor bars (thus avoiding three “3-bars” on top of an “8-bar”), (b) only one kind of factor bar may be used for each factor (thus avoiding two “3-bars” and one “2-bar” on top of an “8-bar”), and (c) the students save their factor bars for later use (especially for page 218).

Factors

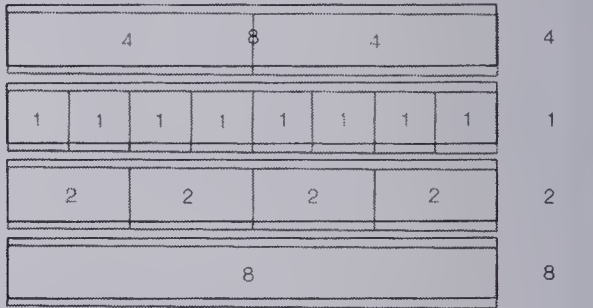
Make bars from cardboard. Label as shown.  
The label tells the length in centimetres of each bar.  
The number in brackets tells the number of those bars to make.



1. Place an 8-bar on your desk.  
Cover it exactly using one kind of bar.  
One way is to use two 4-bars.

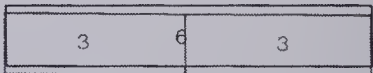
4 is a **factor** of 8.

Are there other ways? **Yes**  
Name the *factors* of 8. **1, 2, 4, 8**



2. Place a 6-bar on your desk.  
Cover it exactly using one kind of bar.  
Discover all the bars that will work.  
Name the *factors* of 6. **1, 2, 3, 6**

3. Repeat for a 12-bar. **Factors are 1, 2, 3, 4, 6, 12**
4. Repeat for a 10-bar. **Factors are 1, 2, 5, 10**



ACTIVITIES

1. Students might enjoy making “Factor Patterns” of the sort shown on the pupil page for Exercise 1. Have the students colour the various factors in patterns and colours which can be used in a bulletin-board display.

2. Have students use coloured squares of gummed paper to make shapes showing various multiplication facts.

Example



- (a)  $2 \times 3$
- (b)  $2 \times 2 \times 2 \times 2$
- (c)  $2 \times 4$
- (d)  $3 \times 3 \times 3$

3. Have students make up patterns such as these.

$$\begin{array}{l} 9 \times 1 = 9 \\ 9 \times 2 = 18 \\ 9 \times 3 = 27 \end{array} \left. \vphantom{\begin{array}{l} 9 \times 1 = 9 \\ 9 \times 2 = 18 \\ 9 \times 3 = 27 \end{array}} \right\} \text{digits total 9}$$

$$\begin{array}{l} \bullet \\ \bullet \\ \bullet \end{array}$$

$$\begin{array}{l} 8 \times 1 = 8 \\ 8 \times 2 = 16 \\ 8 \times 3 = 24 \end{array} \left. \vphantom{\begin{array}{l} 8 \times 1 = 8 \\ 8 \times 2 = 16 \\ 8 \times 3 = 24 \end{array}} \right\} \begin{array}{l} \text{digits total 8} \\ \text{digits total 7} \\ \text{digits total 6} \end{array}$$

$$\begin{array}{l} \bullet \\ \bullet \\ \bullet \end{array}$$



## The Birthday Party

At his birthday party, Freddie and two friends ate 5 hot dogs each.  
How many hot dogs did the 3 boys eat altogether?

$$\begin{array}{ccccc} 3 & \times & 5 & = & 15 \\ \text{Factor} & & \text{Factor} & & \text{Product} \end{array}$$



### Exercises

1. Write the products of these factors.

(a)  $8 \times 9 = \blacksquare 72$  (b)  $3 \times 7 = \blacksquare 21$  (c)  $4 \times 6 = \blacksquare 24$  (d)  $10 \times 10 = \blacksquare 100$   
(e)  $6 \times 8 = \blacksquare 48$  (f)  $9 \times 7 = \blacksquare 63$  (g)  $3 \times 6 = \blacksquare 18$  (h)  $8 \times 8 = \blacksquare 64$

2. Write the missing factors.

(a)  $2 \times \blacksquare 9 = 18$  (b)  $4 \times \blacksquare 9 = 36$  (c)  $\blacksquare 5 \times 10 = 50$  (d)  $9 \times \blacksquare 9 = 81$   
(e)  $5 \times \blacksquare 9 = 45$  (f)  $8 \times \blacksquare 7 = 56$  (g)  $\blacksquare 2 \times 6 = 12$  (h)  $\blacksquare 6 \times 9 = 54$

Copy and complete.

$1 \times \blacksquare 24 = 24$      $2 \times \blacksquare 12 = 24$      $3 \times \blacksquare 8 = 24$      $4 \times \blacksquare 6 = 24$

All the factors of 24 are 1,  $\blacksquare 24$ , 2,  $\blacksquare 12$ , 3,  $\blacksquare 8$ , 4,  $\blacksquare 6$ .

All the factors of 24 listed from the smallest to the largest are 1, 2, 3, 4, 6,  $\blacksquare 8$ ,  $\blacksquare 12$ ,  $\blacksquare 24$ .

4. Copy and complete.

$1 \times \blacksquare 18 = 18$      $2 \times \blacksquare 9 = 18$      $3 \times \blacksquare 6 = 18$

All the factors of 18 are 1,  $\blacksquare 18$ , 2,  $\blacksquare 9$ , 3,  $\blacksquare 6$ .

All the factors of 18 listed from the smallest to the largest are 1, 2, 3,  $\blacksquare 6$ ,  $\blacksquare 9$ ,  $\blacksquare 18$ .

5. Copy and complete.

$1 \times \blacksquare 72 = 72$      $2 \times \blacksquare 36 = 72$      $3 \times \blacksquare 24 = 72$      $4 \times \blacksquare 18 = 72$      $6 \times \blacksquare 12 = 72$      $8 \times \blacksquare 9 = 72$

Write all the factors of 72: 1, 72, 2, 36, 3, 24, 4, 18, 6, 12, 8, 9

Write all the factors of 72 in order smallest to largest: 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72

- ★ 6. What do you notice about the factor 1? 1 is a factor of every whole number.

## OBJECTIVE

To provide practice working with factors

## PACING

Level A 1-5

Level B 1-5

Level C 1-6

## SUGGESTIONS

**Initial Activity** Draw the following grid on the board. Complete the grid with the students. Emphasize the terms “factor” and “product” as you fill in the grid.

×	3	8	4	7	9
4					
9					
8					
3					

## USING THE BOOK

Do Exercises 1 and 2 orally with the students. You may wish to do Exercise 3 on the board with the less able students.

Before assigning all of the exercises, be sure that the students are familiar with the accepted answer format.

## ACTIVITIES

1. Make up copies of grids similar to the one used in the Initial Activity.

2. Make up a 10 by 10 grid numbered 1 to 100. Have students colour specific products to make a design or pattern, e.g., colour all the even products green or all the multiples of 5 red.

3. Prepare a spinner numbered from 0 to 9 so that three to six players can play “Factor Detector”. The first player twirls the spinner twice to yield a number (if 0 and 8 are spun, use “8”) and times the other players who privately write as many factors that come to mind in ten seconds. These players score 5 points for each correct

factor. Play rotates till each player has had a turn (or 2 or 3 turns in the event there are only a few players) being the “twirler-timer”. The player with the greatest accumulated point total wins.

## EXTRA PRACTICE

- True or False?
  - 3 is a factor of 9.
  - 7 is a factor of 21.
  - 4 is a factor of 17.
  - 10 is a factor of 100.
  - 8 is a factor of 25.
  - 6 is a factor of 32.
  - Every number has 1 as a factor.
- There is a number between 20 and 30 which has 3 factors. What is the number?

## OBJECTIVE

To become familiar with the use of factor trees to determine the factors of a number

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

green construction paper

## RELATED AIDS

CALC. W/BK — 35.

## SUGGESTIONS

**Initial Activity** On the chalkboard, draw a tree outline labelled with the number "36". Have the students help you list the factors of 36. As each correct factor is identified, have that student write the factor on a leaf-shaped (or green) piece of construction paper. Display these on the tree and show how a number can be separated (i.e., factored) into its component factors.

Repeat for other numbers to start a "factor forest".

## USING THE BOOK

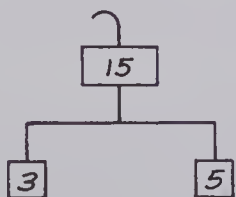
You may wish to demonstrate the first example in Exercises 2, 3, 4, and 5.

Be certain that you inform the students what constitutes an acceptable answer format.

## ACTIVITIES

1. On a bulletin board have students display a number of factor trees using coloured paper.

2. Mobiles of factor trees can be hung around the classroom.



3. Use a grid as shown in the Activity Reservoir for "Quad-Row" (Variation 2) to play "Factor". The first player takes a turn selecting (i.e., crossing off or covering up) a number from the grid and takes this number as a score. The second player scores all of the factors of that number.

### What am I?

I am a tree.  
I have lines.  
I have numbers.  
What am I?

I am a factor tree.

#### Exercises

- Copy these factor trees. Circle the product. Draw boxes around the factors.
 

(a)

(b)

(c)

(d)

(e)

(f)
- Copy and complete these factor trees.
 

(a)

(b)

(c)

(d)

(e)

(f)
- Copy and complete.
 

(a)

(b)

(c)

(d)
- Copy and complete.
 

(a)

(b)

(c)

(d)
- Draw a factor tree for each:
 

(a) 45

(b) 64

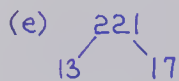
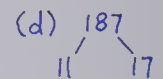
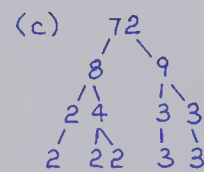
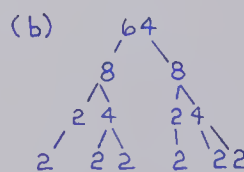
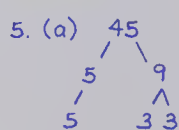
(c) 72

★ (d) 187

★ (e) 221

212 Factor trees

### ANSWERS:



### Sample play.

Player 1      Player 2  
Choose 20,      Score 1, 20, 2, 10,  
Score 20      4, 5, = 42  
  
Score nil —      Choose 17,  
both 1 and 17      Score 17  
have already been  
selected from the  
grid. Choose ... and so on

Players keep a total of their scores. The player with the highest score when all numbers from the grid have been selected wins. (A good strategy — choose prime numbers when possible!)

## EXTRA PRACTICE

Copy and complete.

- $27 = 3 \times 3 \times \square$
- $40 = \square \times 2 \times 2 \times 2$
- $33 = \square \times 3$
- $49 = 7 \times \square$
- $36 = 2 \times \square \times 2 \times 3$
- $60 = 3 \times 2 \times \square \times 5$



# Composite and Prime Numbers

  $1 \times 12 = 12$


  $1 \times 5 = 5$

  $2 \times 6 = 12$

All the factors of 5 are 1, 5.

5 is a **prime number**.

5 has exactly 2 factors.

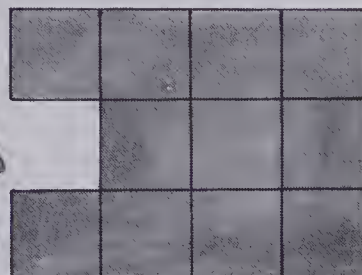
  $3 \times 4 = 12$

All the factors of 12 are

1, 2, 3, 4, 6, 12.

12 has more than 2 factors.

12 is a **composite number**.



## Exercises

- (a) Use 7 squares. How many different rectangles can you make? 1

(b) Repeat for 3, 11, 13, 17, and 19 squares. *Only 1 rectangle can be made each time.*

(c) What kind of numbers are 3, 11, 13, 17, and 19? Why? *The have only 2 factors. Prime numbers*
- (a) Use 6 squares. How many different rectangles can you make? 2

(b) Repeat for 4, 8, 9, 10, 14, and 15 squares. *2 rectangles can be made each time.*

(c) What kind of numbers are they? Why? *They have more than 2 factors. Composite numbers*
- Draw 2 large circles and label one *prime* and one *composite*. Write each of the following numbers in the correct circle.

2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40.
- Why is 1 not a prime number? *It has only 1 factor.*
- Why is 1 not a composite number? *It has only 1 factor.*

Prime and composite numbers 213

## ANSWER:

3. Prime

2, 3, 5, 7, 11,  
13, 17, 19, 23,  
29, 31, 37

Composite

4, 6, 8, 9, 10,  
12, 14, 15, 16, 18,  
20, 21, 22, 24, 25,  
26, 27, 28, 30,  
32, 33, 34, 35,  
36, 38, 39, 40

## ACTIVITIES

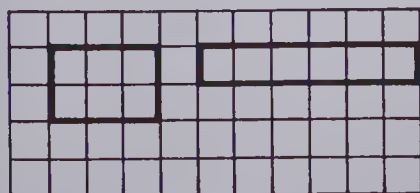
1. The students might enjoy solving riddles such as these.

(a) I have 2 digits. I am a prime number. The sum of my digits is 11. I am between 10 and 30. [29]

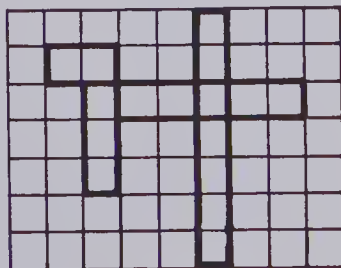
(b) I am a prime number. 3 is one of my factors. What is my other factor? [1]

2. Have the students try "tiling" activities. Choose a whole number. On graph paper, draw as many different *rectangular* shapes with that area as you can.

For example, for 6



3. Have the students make a colourful design using only numbers that have one *rectangular* shape on graph paper.



## EXTRA PRACTICE

Write the numbers 1 to 50. Circle the prime numbers and draw a box around the composite numbers. How many circles? How many boxes?

## OBJECTIVE

To develop the concept of prime and composite numbers

## PACING

Level A 1-3

Level B 1-3

Level C 1-5

## VOCABULARY

prime, composite

## MATERIALS

a number of cards labelled "PRIME" and a number of cards labelled "COMPOSITE", 1 cm or 2 cm squares

## SUGGESTIONS

**Initial Activity** List the numbers 2 to 9 on the chalkboard vertically. Ask students to give all the factors of each number.

*Example*

Number	Factors
2	1, 2
3	1, 3

Indicate that all numbers with only 2 factors are prime; all numbers that have more than 2 factors are composite. Ask a student to choose a card labelled PRIME or COMPOSITE and have them place it beside the appropriate number.

Number	Factors	
2	1, 2	PRIME

Continue until all of the factor sets have been identified as prime or composite. (Note: 1 is not a prime number because it does not have 2 factors.)

## USING THE BOOK

Read through (and demonstrate if necessary) the display shown at the top of the pupil page. Be sure to point out that:

- the various patterns using squares are all rectangular;
- all numbers that have more than 2 factors are composite;
- all numbers that have just 2 factors are prime.

You may also wish to have the students help cut out the squares necessary for Exercises 1 and 2 and/or cut them out from graph paper.

In Exercises 1 and 2, have the students work with the squares and give the answers orally.



## OBJECTIVE

To provide further practice in working with prime and composite numbers

## PACING

Level A All  
Level B All  
Level C All

## SUGGESTIONS

**Initial Activity** Review the terms “prime” and “composite” and what they mean. Assign each student a number. Designate one section of the classroom as **PRIME** and another as **COMPOSITE**. One by one have students walk to the section that is appropriate for their assigned number.

## USING THE BOOK

Some explanation of the phrase “product of their prime factors” may be necessary before assigning Exercises 2 and 4.

When the students have completed Exercise 2, you may wish to go over the factors in the bottom line of each factor tree to bring to the students’ attention that each factor is a prime number.

## ACTIVITIES

- Develop a flow chart to show how to make a factor tree.
- Complete this chart.

Number	Prime Factorization
10	$2 \times 5$
12	$2 \times 2 \times 3$
15	
20	
35	
48	
54	
68	
72	

3. Some composite numbers are called *square* numbers. Using cut-out squares, have the pupils show which numbers between 1 and 100 are square numbers. [4, 9, 16, 25, ...]

## EXTRA PRACTICE

- $5 \times 3 \times 3$
- $2 \times 3 \times 9$
- $3 \times 3 \times 7$
- $2 \times 3 \times 6$
- $2 \times 2 \times 4$
- $3 \times 3 \times 8$

Complete the factoring so that they are all prime factorizations.

## Composite and Prime Numbers

Chrissie Composite



Remember!  
Composite numbers have more than 2 factors

$$8 = 2 \times 4$$

$$8 = 1 \times 8$$

Percy Prime



Remember!  
Prime numbers have exactly 2 factors.

$$7 = 1 \times 7$$

### Exercises

- Make a chart as shown for these numbers:

12, 13, 17, 22, 23, 29, 33, 37, 40, 48, 51, 56, 63, 70.

	Number	Factors	Prime	Composite
(a)	12	1, 2, 3, 4, 6, 12		✓
(b)	13	1, 13	✓	
(c)	17			

- Numbers can be expressed as products of their prime factors. Copy and complete each.

(a) 20      (b) 60      (c) 28

Factor trees for 20, 60, and 28 are shown. Below each tree is a box for the prime factorization:

(a)  $2 \times 2 \times 5 = 20$

(b)  $2 \times 3 \times 2 \times 5 = 60$

(c)  $7 \times 2 \times 2 = 28$

- List, in order from smallest to largest, the prime factors for:

(a) 20 → 2, 2, 5      (b) 60 → 2, 3, 5      (c) 28 → 2, 2, 7

- Write the following as products of their prime factors:

(a) 24 →  $2 \times 2 \times 2 \times 3$       (b) 39 →  $3 \times 13$       (c) 23 (Prime number)      (d) 45 →  $3 \times 3 \times 5$       (e) 31 (Prime number)      (f) 125 →  $5 \times 5 \times 5$       (g) 231 →  $3 \times 7 \times 11$

214 Factoring composite and prime numbers

### ANSWERS:

1. Number	Factors	Prime	Composite
17	1, 17	✓	
22	1, 2, 11, 22		✓
23	1, 23	✓	
29	1, 29	✓	
33	1, 3, 11, 33		✓
37	1, 37	✓	
40	1, 2, 4, 5, 8, 10, 20, 40		✓
48	1, 2, 3, 4, 6, 8, 12, 16, 24, 48		✓
51	1, 3, 17, 51		✓
56	1, 2, 4, 7, 8, 14, 28, 56		✓
63	1, 3, 7, 9, 21, 63		✓
70	1, 2, 5, 7, 10, 14, 35, 70		✓

# The Sieve of Eratosthenes

Eratosthenes (say: "er a TOS the nēs") was a Greek mathematician or math expert who lived about 2200 years ago. He invented a way of showing prime numbers called the Sieve of Eratosthenes.

Copy on graph paper.



	2	3	<del>4</del>	5	<del>6</del>	7	<del>8</del>	<del>9</del>	<del>10</del>
11	<del>12</del>	13	<del>14</del>	<del>15</del>	<del>16</del>	17	<del>18</del>	19	<del>20</del>
<del>21</del>	<del>22</del>	23	<del>24</del>	<del>25</del>	<del>26</del>	<del>27</del>	<del>28</del>	29	<del>30</del>
31	<del>32</del>	<del>33</del>	<del>34</del>	<del>35</del>	<del>36</del>	37	<del>38</del>	<del>39</del>	<del>40</del>
41	<del>42</del>	43	<del>44</del>	<del>45</del>	<del>46</del>	47	<del>48</del>	<del>49</del>	<del>50</del>
<del>51</del>	<del>52</del>	53	<del>54</del>	<del>55</del>	<del>56</del>	<del>57</del>	<del>58</del>	59	<del>60</del>
61	<del>62</del>	<del>63</del>	<del>64</del>	<del>65</del>	<del>66</del>	67	<del>68</del>	<del>69</del>	<del>70</del>
71	<del>72</del>	73	<del>74</del>	<del>75</del>	<del>76</del>	<del>77</del>	<del>78</del>	79	<del>80</del>
<del>81</del>	<del>82</del>	83	<del>84</del>	<del>85</del>	<del>86</del>	<del>87</del>	<del>88</del>	89	<del>90</del>
<del>91</del>	<del>92</del>	<del>93</del>	<del>94</del>	<del>95</del>	<del>96</del>	97	<del>98</del>	<del>99</del>	<del>100</del>

- Do not cross out 2, but cross out all multiples of 2.
- Do not cross out 3, but cross out all multiples of 3.
- Do not cross out 5, but cross out all multiples of 5.
- Do not cross out 7, but cross out all multiples of 7.
- The numbers that are crossed out are ■ numbers. *composite*
- The numbers that are not crossed out are ■ numbers. *prime*

Activity prime and composite numbers 215

## OBJECTIVE

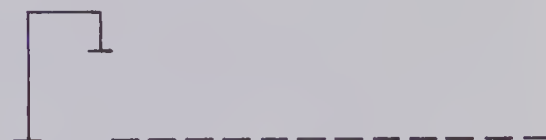
To do an activity involving prime and composite numbers

## PACING

Level A All  
Level B All  
Level C All

## SUGGESTIONS

**Initial Activity** Play the game of "Hang the Puppet". ("Hang the Man" is its better-known name, but we prefer "Hang the Puppet".)



Tell students that the word is the name of a famous old Greek mathematics expert. Students, in turn, suggest a letter of the alphabet. If the letter is contained in the word, write it in on the appropriate short line or lines, e.g., \_ r \_ a etc. If the suggested letter is not in the word, draw the head of the puppet attached to the scaffold, then its body, then its leg, etc. If students guess all the letters before the whole puppet is drawn, then they win. If not, the teacher wins. Eventually identify the name Eratosthenes.

## USING THE BOOK

Review the meaning of "multiple". You may wish to do Exercise 1 with the students by having them identify each multiple of 2 before they cross it out.

Have the students copy and complete Exercises 5 and 6 in their workbooks, substituting the appropriate word for each ■.

## ACTIVITIES

- Have students use the school library to research Eratosthenes.
- The "Sieve" can be made on Bristol board, appropriately coloured, and displayed.

- Use the students' sieves to play "Quad-Row" as described in the Activity Reservoir. You should point out that the sieve does not contain the number one because it is neither prime nor composite.

## OBJECTIVE

To develop the concept of common factors

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

circles of different colours made from construction paper, pictures of animals, collection of textbooks

## SUGGESTIONS

**Initial Activity** Establish the meaning of the term “common” by making two sets of coloured circles. Make a single colour common to both sets. The rest of the colours in Set One should be different from the colours in Set Two.



Ask which colour is found in both sets or groups.

Make two sets of animal pictures. A picture of one kind of animal, e.g., a dog, should be in both groups. The other animal pictures should be different. Ask what kind of animal is in both sets. Explain that “common” is the term used to indicate that something is found in each group. Ask: “What is the common colour in both sets?” [Blue] “What is the common animal found in both sets?” [Dog]

Make up two sets of textbooks with perhaps a speller and math book found in both sets. Ask: “What are the common textbooks in both sets?” [Speller and math]

Use the display at the top of the pupil page to introduce the concept of common factors.

## USING THE BOOK

Read through the display at the top of the pupil page together. Be sure to emphasize the progression from (a) number to (b) factors to (c) common factors.

You may wish to do Exercise 1 with less able students before assigning the other exercises.

## ACTIVITIES

1. Have students draw and cut out three identical geometric shapes from construction paper. Each student chooses two numbers. In the first shape, they write the factors of the first number. In the second shape, they write the factors of the second number. On

## Common Factors

Jeff listed the factors of 24.

Number	Factors								
24	1	2	3	4	6	8	12	24	

36	1 × 36
	2 × 18
	3 × 12
	4 × 9
	6 × 6

Sandra listed the factors of 36.

Number	Factors									
36	1	2	3	4	6	9	12	18	36	

Some numbers are in both lists.

These are **common factors** and they are: 1, 2, 3, 4, 6, and 12.

### Exercises

- List the factors of 6.
  - List the factors of 8.
  - Draw  $\triangle$ 's around the common factors of 6 and 8.
- List the factors of 9.
  - List the factors of 15.
  - Draw squares around the common factors of 9 and 15.
- List the factors of 12.
  - List the factors of 18.
  - Draw circles around the common factors of 12 and 18.  
*1, 2, 4, 8, 16*      *1, 2, 3, 4, 6, 8, 12, 24*
- List the factors of 16.
  - List the factors of 24.
  - List the common factors of 16 and 24. *1, 2, 4, 8*

### Activity

Use a set of cards numbered 1 to 50.

Each player draws a card from the pile.

All players write the factors for the drawn number.

The player with the most correct factors scores a point for each factor.

The winner is the player with the most points after 10 plays.

216 Common factors

### ANSWERS:

- $\triangle_1$   $\triangle_2$  3, 6
  - $\triangle_1$   $\triangle_2$  4, 8
  - (a)  $\square_1$   $\square_3$  9
  - (b)  $\square_1$   $\square_3$  5, 15
  - (a)  $\circ_1$   $\circ_2$   $\circ_3$  4,  $\circ_6$  12
  - (b)  $\circ_1$   $\circ_2$   $\circ_3$   $\circ_6$  9, 18

the third shape, they write the common factors.

2. Make bulletin-board displays of the “common factor shapes” made in Activity 1.

3. Divide the group into three's to play “Common Factor”. The first player twirls a spinner (numbered from 0 to 9) twice to yield a number (if 0 and 6 are spun, use 6) and writes the factors of that number. The second player twirls the spinner twice also and writes the factors for the second, different number. The third player looks at the

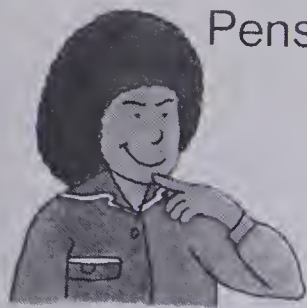
factor lists from players 1 and 2 and identifies the common factors, scoring a number of points equal to the total of the common factors. Play rotates three times. The player with the greatest number of points wins.

*Note:* The third player should make certain no factors are missing, thereby lessening the potential total.

## EXTRA PRACTICE

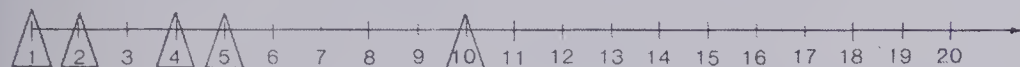
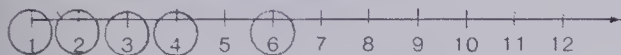
Write the numbers between 1 and 20 that have 3 as a common factor, 4 as a common factor, 5 as a common factor.





## Pensive Priscilla's Problem

Priscilla puzzled and she pondered  
But this problem really racked her.  
For the numbers 12 and 20  
What is the greatest common factor?



The common factors of 12 and 20 are 1, 2, and 4.  
The **greatest common factor** is 4.

### Exercises

Copy and complete.

	Numbers	Factors	Common Factors	Greatest Common Factor
(a)	6 9	① 2 ③ 6 ① ③ 9	1 3	3
(b)				
(c)				
(d)				
(e)				

Greatest common factor 217

## OBJECTIVE

To find the greatest common factor of any two numbers

## PACING

Level A All  
Level B All  
Level C All

## SUGGESTIONS

**Initial Activity** Write two numbers on the board. Have half of the class list the factors of the first number. The other half lists the factors of the second number. The factors should be written in order from smallest to largest. Have a student who has worked with the smaller number to start naming the factors by beginning with the largest and working down. As soon as a factor is named that is contained in the other number, the students call "Stop". This factor will be the greatest common factor. Repeat this process several times.

## USING THE BOOK

Read through "Pensive Priscilla's Problem" together as shown at the top of the pupil page. Be sure to identify (a) the circled numbers on the first number line as being the factors of 12; (b) the second number line as showing the factors of 20; and (c) the greatest common factor.

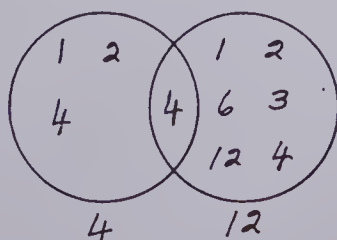
Have students draw the chart. Go over Exercise (a) with them to establish how the chart is to be completed. With less able students, you may wish to do Exercise (b) with them on the board before assigning the rest of the exercises.

### ANSWERS:

- (b) ① ② ④ ⑧  
① ② ③ ④ ⑥ ⑧ 12, 24 1, 2, 4, 8 8
- (c) ① ② 7, 14  
① ② 4, 5, 10, 20 1, 2 2
- (d) ① 2 ⑤ 10  
① 3 ⑤ 15 1, 5 5
- (e) ① ② ③ ④ ⑥ ⑧ ⑨ ⑫ 18, 36  
① ② ③ ④ ⑥ ⑧ ⑫ 16, 24, 48 1, 2, 3, 4, 6, 12, 12

## ACTIVITIES

1. Have the students draw two overlapping circles. Choose two numbers. In one circle write the factors of the first number. In the other circle write the factors of the second number. In the part that overlaps write the greatest common factor.



2. Choose two numbers. Draw two corresponding number lines. Identify the factors of each number on its corresponding number line. Identify the greatest common factor.

3. Develop a flow chart which shows how to find the greatest common factor.

## EXTRA PRACTICE

- 28, 36
- 39, 54
- 63, 84
- 48, 72
- 27, 81
- 31, 52
- 24, 45
- 12, 27
- 24, 32
- 80, 100

## OBJECTIVE

To introduce the concept of multiples

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

multiple

## MATERIALS

cardboard "factor bars" from page 210,  
overhead projector (optional) or felt  
board and felt bars (optional)

## SUGGESTIONS

**Initial Activity** Have students count by 2's up to 20. List the counted numbers on the board. Have them count by 3's, then by 4's, and by 5's. List these on the board. Introduce the term "multiple". Indicate that the first list of numbers are multiples of 2, the second list are multiples of 3, and so on. Ask students to write the multiples of 6 up to 60 to ascertain if they have grasped the concept.

## USING THE BOOK

Read through all of the instructions together as a group. As suggested on page 210, when all of the students have a bar set, have them work at their desks while you demonstrate using a set of bars on the chalkboard, overhead projector, or felt board.

Be sure to list the multiples of each number worked with and point out the relationship between the numbers in the multiple list and the "bars" that were used.

As you work through the examples, stress that (a) only bars which cover each other exactly can be used (thus avoiding a "9-bar" on top of two "4-bars"); and (b) that only one kind of bar may be used when building up patterns (thereby avoiding five "1-bars" and two "2-bars" being matched to a "9-bar").

## ACTIVITIES

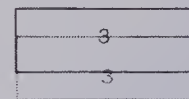
1. Use flash cards to reinforce the concept of multiples. Choose a number and show the flash cards. Students identify the numbers that are the multiples of the chosen number.

2. Play the "Zap-Thunk Game". All multiples of 3 are called "Zap", all multiples of 5 are called "Thunk". Students begin to count, substituting "Zap" for multiples of 3 and "Thunk"

## Multiples

Use the bars from the Factors Activity on Page 210.

1. (a) Place a 3-bar on the desk.  
Which one bar will cover this bar exactly?  
The only bar is another 3-bar.  
3 is a **multiple** of 3.



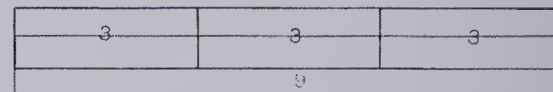
3

- (b) Place two 3-bars end to end on the desk.  
Which one bar will cover this exactly?  
The only bar is the 6-bar.  
6 is a **multiple** of 3.



6

- (c) Place three 3-bars end to end on the desk.  
Which one bar will cover this exactly? **9-bar**  
**9** is a **multiple** of 3.

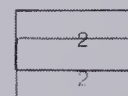


9

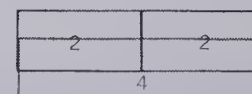
- (d) Name other multiples of 3.  
**12, 15, 18, 21, ...**

Multiples

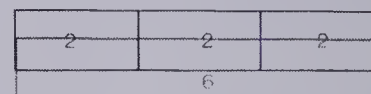
2. Use the 2-bars.  
Repeat Steps (a) to (d) above.  
Name multiples of 2.  
**2, 4, 6, 8, ...**



2

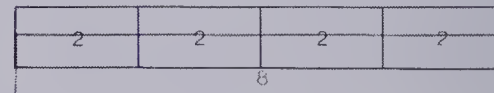


4



6

3. Use 4-bars.  
Repeat Steps (a) to (d).  
Name multiples of 4. **4, 8, 12, 16, 20, ...**



8

218 Activity introduction of multiples

for multiples of 5; e.g., 1, 2, Zap, 4, Thunk, Zap, 7, 8, Zap, Thunk, etc.

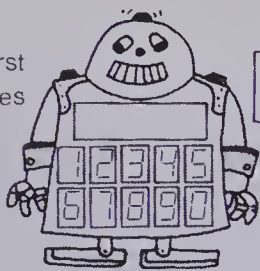
3. Have the pupils play "Beat the Clock". Ask them: "How many multiples of 4 can you write in 30 s?" "How many multiples of 5 can you write in 1 min?"

## EXTRA PRACTICE

- List the first 4 multiples of each.  
2, 7, 8, 9, 10, 11, 12, 13, 14
- True or false?  
(a) 72 is a multiple of 8.  
(b) 16 is a multiple of 3.  
(c) 48 is a multiple of 6.  
(d) 54 is a multiple of 7.  
(e) 36 is a multiple of 5.  
(f) 81 is a multiple of 9.

# Omega-Y, The Multiple Maker

**Command**  
Print the first  
five multiples  
of 2.

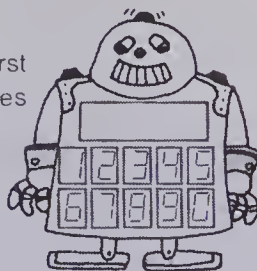


**Display**  
2, 4, 6,  
8, 10

**Command**  
Print the next five  
multiples of 2.

**Display**  
12, 14, 16,  
18, 20

**Command**  
Print the first  
five multiples  
of 3.



**Display**  
3, 6, 9,  
12, 15

**Command**  
Print the next five  
multiples of 3.

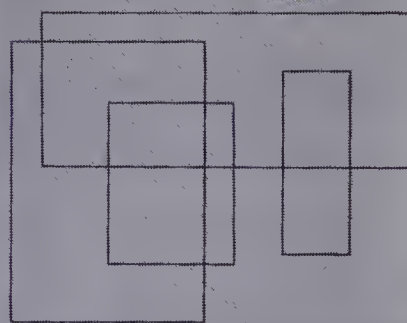
**Display**  
18, 21, 24,  
27, 30

## Exercises

- Copy and complete. Write the missing multiples.  
(a) 4, 8, ■, 16, ■, 24, ■, 32, ■  
(b) 5, ■, 15, ■, 25, ■, 35, ■, 45, ■  
(c) 10, ■, 30, 40, ■, ■, 70, ■, ■, 100.
- Write the multiples of 6 up to 60.  
6, 12, 18, 24, 30, 36, 42, 48, 54, 60
- Write the multiples of 7 up to 56.  
7, 14, 21, 28, 35, 42, 49, 56
- Write the multiples of 8 up to 64.  
8, 16, 24, 32, 40, 48, 56, 64
- Write any four multiples of 9.  
9, 18, 27, 36 *Answers will vary.*
- Write the multiples of 3 (up to 30) which are even numbers.  
6, 12, 18, 24, 30
- Write the first five multiples of 13.  
13, 26, 39, 52, 65
- ★ Choose any 2-digit number larger than 20. Write the first five multiples of your number.
- ★ Choose any 3-digit number. Write the first five multiples of your number. *Answers will vary.*

## BRAINTICKLER

How many rectangles? 15



## OBJECTIVE

To develop the concept of multiples

## PACING

Level A 1-7  
Level B 1-7  
Level C 1-9

## RELATED AIDS

HMS — DM50.  
CALC. W/BK — 34.

## SUGGESTIONS

**Initial Activity** Review the meaning of the term "multiple". On the board write the numbers 1 to 50. Instruct a student to circle all the multiples of 5 with coloured chalk. Another student boxes all the multiples of 6; a third student underlines all the multiples of 7.

## USING THE BOOK

Read through both sides of the pupil display with the group. Have someone identify and write on the chalkboard the correct number for each ■ (i.e., the next five multiples of 2 and 3 respectively).

Complete Exercise 1(a) on the chalkboard with the students. You may wish to do the first two or three multiples of Exercise 2 with them.

## ACTIVITIES

1. Make multiple copies of a 10 by 10 grid. Have students choose any 4 numbers. Students create a design by colouring in the squares that represent the multiples of their chosen numbers. Other students look at the designs and tell what the 4 chosen numbers were.

2. Students choose 3 numbers. Then they draw number lines showing the multiples of their chosen numbers.

3. Have students make their own drawing of an imaginary multiple maker. They can give it an appropriate name and also tell how it works or write an expository paragraph about it.

## EXTRA PRACTICE

Is the second number a multiple of the first?

- |             |             |             |
|-------------|-------------|-------------|
| (a) 4, 13   | (b) 5, 25   | (c) 9, 36   |
| (d) 4, 19   | (e) 13, 29  | (f) 16, 48  |
| (g) 8, 96   | (h) 10, 100 | (i) 15, 140 |
| (j) 92, 184 | (k) 66, 347 | (l) 12, 144 |

## ANSWERS:

Display	12, 14, 16	Display	18, 21, 24
	18, 20		27, 30



OBJECTIVE  
To introduce common multiples

PACING  
Level A 1-5  
Level B 1-5  
Level C 1-6

RELATED AIDS  
HMS — DM51.

SUGGESTIONS  
Initial Activity Review the meaning of the term “common” as used in the lesson on “common factors” (page 216).

Draw an 8 by 8 grid on the board and number the squares from 1 to 64. Have one student draw a coloured diagonal line (/) through all the multiples of 3. Have another student draw a diagonal line (\) of another colour through the multiples of 6. The squares with 2 diagonal lines are the common multiples.

USING THE BOOK  
Have the pupils look at Omega-Y and the example at the top of the pupil page. Identify the numbers in each list as multiples of 2 and 4 respectively. Point out that the first four numbers common to each list have been circled. You may wish to also note that just some common multiples of 2 and 4 have been listed. The list could have gone on “forever”.

Assign the exercises. Inform the pupils that it is easier to identify the common multiples if the multiples are arranged one under the other, rather than side by side.

2	4	6	8	10	etc.
3	6	9	12	15	etc.

ACTIVITIES

1. Have students choose 2 numbers. On a number line have them show the common multiples.

2. Play “Bingo” as described in the Activity Reservoir. Use “multiple groups” (i.e., 3, 6, 9, 12, etc.) as a source for data for the blank grids.

3. Students play in pairs with a deck of cards numbered from 1 to 100. The deck is shuffled and dealt so that each player has 50 cards. They choose a number. Each student turns up a card in turn and places it in a pile in the centre. When a card that is a multiple of the chosen number is turned up, the first student to shout “Multiple” wins the pile. The one who has the most cards at the end of a given time wins.

### Common Multiples

Multiples of 2

2, 4, 6, 8, 10, 12, 14, 16, 18...

Multiples of 4

4, 8, 12, 16, 20, 24, 28...

Omega-Y shows some common multiples of 2 and 4.

4, 8, 12, 16.

#### Exercises

1. (a) Write the multiples of 3 up to 36.  
(b) Write the multiples of 4 up to 36.  
(c) Circle the common multiples.

2. (a) Write the multiples of 5 up to 60.  
(b) Write the multiples of 6 up to 60.  
(c) Circle the common multiples.

3. (a) Write the multiples of 4 up to 60.  
(b) Write the multiples of 10 up to 60.  
(c) Circle the common multiples.

4. (a) Write the multiples of 6 up to 48.  
(b) Write the multiples of 8 up to 48.  
(c) Circle the common multiples.

5. Copy and complete. Write the missing multiples of 2 and 3.  
2, 4, <sup>6</sup>■, 8, 10, <sup>12</sup>■, 14, 16, <sup>18</sup>■, 20, 22, <sup>24</sup>■  
3, <sup>6</sup>■, 9, <sup>12</sup>■, 15, <sup>18</sup>■, 21, <sup>24</sup>■, 27, 30.  
List the common multiples of 2 and 3 <sup>6, 12, 18, 24</sup>

6. Write the first three common multiples of:  
(a) 2 and 3 <sup>6, 12, 18</sup> (b) 5 and 10 <sup>10, 20, 30</sup> (c) 2 and 4 <sup>4, 8, 12</sup>  
(d) 3 and 4 <sup>12, 24, 36</sup> (e) 4 and 5 <sup>20, 40, 60</sup> (f) 3 and 6 <sup>6, 12, 18</sup>

220 Common multiples

ANSWERS:

1. (a) 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36  
(b) 4, 8, 12, 16, 20, 24, 28, 32, 36

2. (a) 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60  
(b) 6, 12, 18, 24, 30, 36, 42, 48, 54, 60

3. (a) 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60  
(b) 10, 20, 30, 40, 50, 60

4. (a) 6, 12, 18, 24, 30, 36, 42, 48  
(b) 8, 16, 24, 32, 40, 48

EXTRA PRACTICE

Find the first 4 common multiples of each pair.

(a) 3, 5	(b) 4, 6	(c) 8, 9
(d) 4, 9	(e) 6, 10	(f) 3, 5
(g) 2, 7	(h) 4, 5	(i) 6, 8

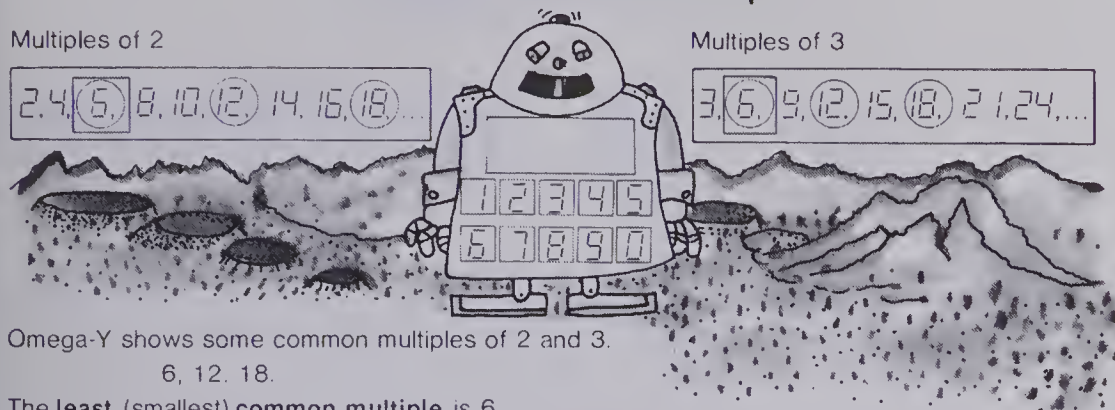
# Least Common Multiple

Multiples of 2

2, 4, 6, 8, 10, 12, 14, 16, 18, ...

Multiples of 3

3, 6, 9, 12, 15, 18, 21, 24, ...



Omega-Y shows some common multiples of 2 and 3.  
6, 12, 18.

The **least** (smallest) **common multiple** is 6.

## Exercises

Copy and complete.

	Numbers	Multiples	Common Multiples	Least Common Multiple
(a)	3 5	3, 6, 9, 12, 15, 18, 21, 24, 27, 30 5, 10, 15, 20, 25, 30, 35, 40, 45, 50	15, 30	15
(b)	4 6	4, 8, 12, 16, 20, 24, 28, 32, 36, 40 6, 12, 18, 24, 30, 36, 42, 48, 54, 60	12, 24, 36	12
(c)	2 3	2, 4, 6, 8, 10, 12, 14, 16, 18, 20 3, 6, 9, 12, 15, 18, 21, 24, 27, 30	6, 12, 18	6
(d)	4 8	4, 8, 12, 16, 20, 24, 28, 32, 36, 40 8, 16, 24, 32, 40, 48, 56, 64, 72, 80	8, 16, 24, 32	8
(e)	5 10	5, 10, 15, 20, 25, 30, 35, 40, 45, 50 10, 20, 30, 40, 50, 60, 70, 80, 90, 100	10, 20, 30, 40	10
(f)	3 9	3, 6, 9, 12, 15, 18, 21, 24, 27, 30 9, 18, 27, 36, 45, 54, 63, 72, 81, 90	9, 18, 27	9

Least common multiple 221

## ANSWERS:

(b) 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, 96, 100

(c) 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60

(d) 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, 96, 100

(e) 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100

(f) 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96, 99, 102

## OBJECTIVE

To develop the concept of least common multiple

## PACING

Level A All

Level B All

Level C All

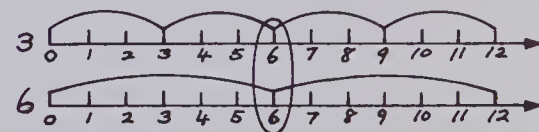
## RELATED AIDS

HMS — DM52.

## SUGGESTIONS

**Initial Activity** Review what was meant by "greatest common factor" (page 217). Ask students what is the opposite of greatest. [Least]

Draw 2 number lines on the board one under the other. On the top line show multiples of 3. On the bottom line show multiples of 6. Ask students to identify the least (smallest) common multiple.



The least common multiple is 6.

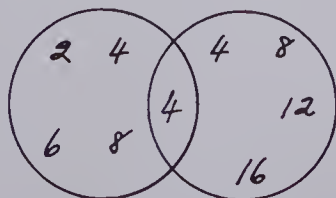
## USING THE BOOK

Have students draw the chart. Use Exercise (a) to establish what is required to complete the chart. You may wish to do Exercise (b) on the board with the students before assigning the rest of the exercises. Average and above average students will grasp this concept without much difficulty.

## ACTIVITIES

1. Students choose 2 numbers. Draw number lines to show multiples. Identify the least common multiple.

2. Have the students draw 2 overlapping circles.



In one circle write the first four multiples of 2. In the other circle write the first four multiples of 4. In the section of the overlap write the least common multiple.

3. See "Omega-Y" as described in the Activity Reservoir. Be sure to use situations such as: given 5, Omega-Y gives you 10, 15, 20, 25, ...

## EXTRA PRACTICE

Find the least common multiple for these pairs of numbers.

- (a) 4, 6      (b) 4, 12      (c) 6, 5  
(d) 2, 17      (e) 6, 10      (f) 16, 24



## OBJECTIVE

To introduce the concept of exponents

## PACING

Level A 1-3

Level B 1-3










Level C 1-4

## VOCABULARY

exponent

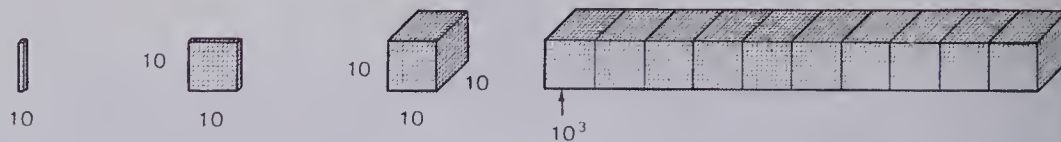
## SUGGESTIONS

**Initial Activity** Draw this on the board

 and ask students what they think it means.  means   $\times$  . Next draw  and ask if they know what it means.  means   $\times$    $\times$  . Next ask

them what  $y^2$  means. [It means  $y \times y$ .] What does  $4^3$  mean? [It means  $4 \times 4 \times 4$ .] Explain to students that  $4^3$  is a short way to show multiplication when the same factor is used more than once. The factor is called the *base* and the small number tells the number of times the base is used as a factor. The small number is called the *exponent*. Use the display at the top of the pupil page to reinforce the preparatory work.

## Using Exponents



$$10 = 10 = 10^1$$

$$10 \times 10 = 100 = 10^2$$

$$10 \times 10 \times 10 = 1000 = 10^3$$

$$10 \times 10 \times 10 \times 10 = 10\,000 = 10^4$$

Exponent

Base

We say: "ten to the exponent two".

### Exercises

- Read, then write.
  - Ten to the exponent two.  $10^2$
  - Ten to the exponent three.  $10^3$
  - Ten to the exponent four.  $10^4$
- Copy and complete.
  - $\square \times \square = 10^2$
  - $\square \times \square \times \square = 10^3$
  - $\square \times \square \times \square \times \square = 10^4$
- Write each number in the exponent form.
  - $100 = \square^{10^2}$
  - $1000 = \square^{10^3}$
  - $10\,000 = \square^{10^4}$
- We can multiply powers of 10 by ones. Copy and complete each.
  - $4 \times 10^1$  means 40  
 $4 \times 10^2$  means 400  
 $4 \times 10^3$  means  $\square^{4000}$
  - $3 \times 10^1$  means  $\square^{30}$   
 $3 \times 10^2$  means 300  
 $3 \times 10^3$  means 3000
  - $6 \times 10^1$  means  $\square^{60}$   
 $6 \times 10^2$  means  $\square^{600}$   
 $6 \times 10^3$  means 6000
  - $\square \times \square$  means 90  
 $\square \times \square$  means 900  
 $\square \times \square$  means 9000

222 Expressing 10, 100, 1000, 10 000 using exponents

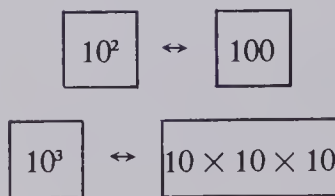
## USING THE BOOK

Have the students look at the display at the top of the pupil page. Point out that there are four different quantities shown (i.e., 10, 100, 1000, and 10 000), each of which is expressed three ways (using blocks; using factors —  $10 \times 10$ ; using exponents —  $10^2$ ). You may wish to use actual cubes to demonstrate this. Stress that a ten is shown by a "ten-stack" (i.e., ten single cubes) by "10" and by " $10^1$ "; a hundred is shown by a "hundreds-flat" (i.e., 10 tens-stacks), "100" and by " $10^2$ "; a thousand is shown by a "thousand-block" (i.e., not three hundreds-flats, but ten hundreds-flats), by "1000" and by " $10^3$ ". Repeat this for ten thousand. Have the students verbalize each situation (i.e., "ten to the exponent three", and so on).

Assign the exercises. Be clear about how you would like the students to answer in their exercise books.

## ACTIVITIES

1. Play "Concentration" as described in the Activity Reservoir. Use cards such as these.



2. Make two dice. The first die is marked with  $10^2$ ,  $10^3$ ,  $10^4$ ,  $10^5$ , and two wild faces. The second die is marked 100, 1000, 10 000, 100 000, and two wild faces. Players roll the dice. If they get a match, they win a point. A wild face is an automatic match. A roll of two wild faces is worth 2 points. The player with the most points after ten rounds wins.

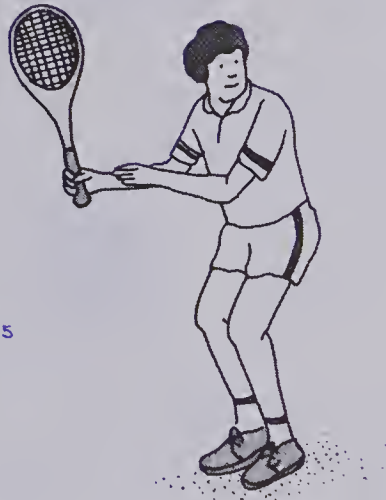
3. Have the Level C students copy and complete expressions such as these.

- $5 \times 10^3 = 5 \times \square = \triangle$
- $2 \times 10^2 = 2 \times \square = \triangle$
- $4 \times 10^4 = 4 \times \square = \triangle$
- $6 \times 10^3 = 6 \times \square = \triangle$



# Practice Makes Perfect

- Which numbers between 4 and 30 are divisible by 6? *6, 12, 18, 24*
- Copy and complete.  
A number is divisible by 10 if the one's digit is  $\square^0$ .  
A number is divisible by 5 if the one's digit is  $\square^5$  or  $\square^0$ .
- Write all the factors of each.  
(a) 32 *1, 2, 4, 8, 16, 32* (b) 21 *1, 3, 7, 21* (c) 54 *1, 2, 3, 6, 9, 18, 27, 54* (d) 26 *1, 2, 13, 26* (e) 40 *1, 2, 4, 5, 8, 10, 20, 40*
- Write the following numbers as products of their prime factors. (Draw factor trees.)  
(a) 63 (b) 88 (c) 16 (d) 49 (e) 54
- Write these numbers. Circle the composite numbers.  
*52, 73, 4, 55, 106, 7, 48, 129, 210, 11, 124, 19, 714, 515, 416, 31.*
- (a) Write the factors of 6. *1, 2, 3, 6*  
(b) Write the factors of 9. *1, 3, 9*  
(c) Write the common factors. *1, 3*  
(d) Write the greatest common factor. *3*
- (a) Write the multiples of 4 up to 60.  
(b) Write the multiples of 6 up to 60.  
(c) Write the common multiples.  
(d) Write the least common multiple. *12*
- Write each number in the exponent form.  
(a) 10  *$10^1$*  (b) 1000  *$10^3$*   
(c) 10 000  *$10^4$*  ★ (d) 100 000  *$10^5$*



Practice 223

## OBJECTIVE

To practise concepts developed in this chapter

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

HMS — DM53.  
CALC. W/BK — 52.

## USING THE BOOK

With average and above average students, you may wish to assign this page without any review of the concepts. Less able students may require some review of each concept before assigning the questions.

Provide remedial work for students who are still experiencing difficulty with the concepts.

## ACTIVITIES

1. To review multiples, prepare on small cards the first 6 multiples of the numbers 2 to 10, one multiple showing per card. Label 9 containers (boxes, cans, envelopes, etc.) with labels which show "multiples of 2", "multiples of 3", and so on up to "multiples of 10". Have the cards shuffled and then sorted into their appropriate containers.

2. Using the materials in Activity 1, relabel (or add to the other side of) the containers to show "divisible by 2", "divisible by 3", and so on.

3. See "Batter Up" as described in the Activity Reservoir. Use some skills cards such as these.

3  
Odd number?

5  
Even number?

Name a  
composite  
number.

A factor of  
17 is ?.

### ANSWERS:

- (a)  $\begin{array}{c} 63 \\ / \quad \backslash \\ 7 \quad 9 \\ / \quad \backslash \\ 7 \quad 3 \times 3 \end{array}$  (b)  $\begin{array}{c} 88 \\ / \quad \backslash \\ 8 \quad 11 \\ / \quad \backslash \\ 2 \quad 4 \\ / \quad \backslash \\ 2 \quad 2 \times 2 \quad 11 \end{array}$  (c)  $\begin{array}{c} 16 \\ / \quad \backslash \\ 4 \quad 4 \\ / \quad \backslash \\ 2 \quad 2 \times 2 \times 2 \end{array}$  (d)  $\begin{array}{c} 49 \\ / \quad \backslash \\ 7 \quad 7 \end{array}$  (e)  $\begin{array}{c} 54 \\ / \quad \backslash \\ 6 \quad 9 \\ / \quad \backslash \quad / \quad \backslash \\ 2 \quad 3 \quad 3 \quad 3 \end{array}$
- (a) 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60  
(b) 6, 12, 18, 24, 30, 36, 42, 48, 54, 60  
(c) 12, 24, 36, 48, 60

OBJECTIVE

To relate problem solving to everyday life

PACING

- Level A 1-3
- Level B 1-6
- Level C 1-7

MATERIALS

newspapers

VOCABULARY

advertisements

RELATED AIDS









- HMS — DM54.
- CALC. W/BK — 13.

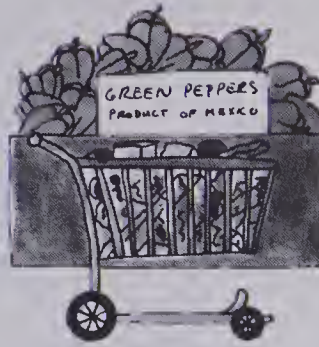
SUGGESTIONS

**Initial Activity** Find the newspaper advertisements for food specials. Have students read some of them aloud. Choose some of the items that can be computed mentally and ask questions such as: "What will 4 lettuce cost? How much change from \$2.00?" and so on.

USING THE BOOK

It may be necessary to read the advertisements and the problems with less able students who may be hindered by poor ability in reading.

The Food Mart	
<div>REGULAR OR DIET POPSI-COLA</div> <div>39¢ plus 30¢ deposit</div> <div></div>	<div>LIGHT BULBS</div> <div>6 for \$1.38</div> <div></div>
<div>PERRY PUDDING CUPS</div> <div>Reg. Price \$1.27</div> <div>99¢ each</div> <div></div>	<div>Produce of USA Canada No. 1 Grade</div> <div>HEAD LETTUCE</div> <div>Reg. Price 89¢</div> <div>59¢</div> <div></div>
<div>THOMSON'S PURE APPLE JUICE</div> <div>69¢</div> <div></div>	<div>BRAMBLE'S TOMATO SOUP</div> <div>Reg. Price 24¢ each</div> <div>4 for 80¢</div> <div></div> <div></div>
<div>JUICE GLASSES</div> <div> 8 for \$2.32</div>	<div>Produce of Mexico Canada No. 1 Grade</div> <div>GREEN PEPPERS</div> <div>29¢ each</div>



Read the advertisements for Food Mart "Super Specials", then answer the questions.

1. (a) What is the sale price of 2 dozen cans of Bramble's soup? **\$4.80**  
 (b) At the regular price, what would 2 dozen cans cost? **\$5.76**  
 (c) What do you save? **\$0.96**
2. (a) What is the price of 1 juice glass? **\$0.29**  
 (b) What is the price of 6 juice glasses? **\$1.74**
3. How many green peppers can you buy for \$1.75? **6**
4. (a) How much do you save on 1 Perry Pudding Cup at the sale price? **\$0.28**  
 (b) How much will you save on 6 pudding cups? **\$1.68**  
 (c) If you buy 6 pudding cups and pay with a ten-dollar bill, how much change will you receive? **\$4.06**
5. (a) What is the price of 9 cans of Thomson's Pure Apple Juice? **\$6.21**  
 (b) At the regular price, what would 9 cans of apple juice cost? **\$12.42**  
 (c) How much do you save? **\$6.21**
6. (a) What is the total cost of 1 bottle of Popsi-Cola (including deposit)? **\$0.69**  
 (b) What is the cost of 12 bottles? **\$8.28**
- ★7. What is the price of 6 dozen light bulbs? **\$16.56**

## ACTIVITIES

1. Set up a shopping centre in your classroom. Packages, cans, bottles, and containers of food and drinks can be displayed on a counter. Students take turns being shoppers and cashiers.

2. Have students make up advertisements of items for sale. Display them on a bulletin board.

3. Using the newspaper advertisement, have students make up problems pertaining to the advertisement.

## EXTRA PRACTICE

Students solve the problems made up in Activity 3.



OBJECTIVE

To evaluate achievement of the chapter objectives

PACING

- Level A All
- Level B All
- Level C All

RELATED AIDS

HMS — DM55.

USING THE BOOK

Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a large number of students had difficulty with a particular topic or concept. The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 196).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1-3	B	206-209
4	D	213-215
5, 13	A	198-203
6-9	C	210-212, 216, 217
10, 11	E	218-221
12	F	222

Chapter Test

- Consider 3456. Tell if it is divisible by each of the following numbers.  
(a) 2 Yes (b) 3 Yes (c) 4 Yes (d) 5 No (e) 10 No
- How do you recognize numbers that are divisible by  
(a) 3 (b) 4 (c) 5?
- Which of these numbers are divisible by 9?  
(a) 18 (b) 104 (c) 27 (d) 324 (e) 558
- Which of these are prime numbers? Which are composite numbers?  
(a) 7 Prime (b) 12 Composite (c) 19 Prime (d) 22 Composite (e) 27 Composite
- Copy and complete.  
(a)  $3 \times 48 = 3 \times (40 + 8)$   
 $= (3 \times 40) + (3 \times 8)$   
 $= 120 + 24$   
 $= 144$   
(b)  $(16 + 17) + 33 = 16 + (17 + 33)$   
 $= 16 + 50$   
 $= 66$
- Write all factors for each of the following.  
(a) 15 1, 3, 5, 15 (b) 18 1, 2, 3, 6, 9, 18 (c) 35 1, 5, 7, 35 (d) 100 1, 2, 3, 4, 5, 10, 20, 25, 50, 100
- Express the following as products of their prime factors.  
(a) 28  $2 \times 2 \times 7$  (b) 30  $2 \times 3 \times 5$  (c) 45  $3 \times 3 \times 5$  (d) 72  $2 \times 2 \times 2 \times 3 \times 3$
- (a) Write the factors of 16. 1, 2, 4, 8, 16 (b) Write the factors of 24. 1, 2, 3, 4, 6, 8, 12, 24
- Write the greatest common factor of 8 and 12. 4
- Write the first 5 multiples of 12. 12, 24, 36, 48, 60
- Write the least common multiple of 6 and 8. 24
- Write the following numbers in exponent form.  
(a) 100  $10^2$  (b) 1000  $10^3$  (c) 10 000  $10^4$
- Which are true statements? (a), (f)  
(a)  $13 \times 29 = 29 \times 13$  (b)  $4 - 14 = 14 - 4$  (c)  $52 \div 3 = 3 - 52$   
(d)  $6 \times 0 = 6$  (e)  $7 \div 0 = 0$  (f)  $318 \times 1 = 318$

226 Chapter 7 test

- ANSWERS:
2. (a) The sum of its digits is divisible by 3. (b) The last 2 digits are divisible by 4. (c) The one's digit is 5 or 0.
3. (a) 18 (c) 27 (d) 324 (e) 558

## Cumulative Review

1. Write in words.

- (a) 47.4 (b) 7 349 042 (c) 58 324 (d) 85.46

2. Find the sums and differences.

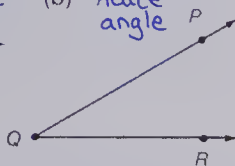
- (a) 
$$\begin{array}{r} 13\,299 \\ 3\,485 \\ 26\,041 \\ + 9\,175 \\ \hline 52\,000 \end{array}$$
- (b) 
$$\begin{array}{r} 27.63 \\ 48.05 \\ + 19.17 \\ \hline 94.85 \end{array}$$
- (c) 
$$\begin{array}{r} 74\,325 \\ - 26\,091 \\ \hline 48\,234 \end{array}$$
- (d) 
$$\begin{array}{r} 9.58 \\ - 4.19 \\ \hline 5.39 \end{array}$$

3. Name each angle as acute, obtuse, right, or straight angle.

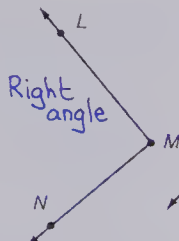
(a) *Straight angle*



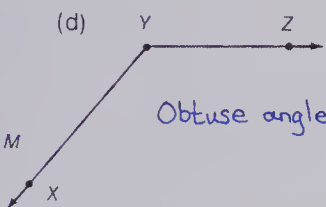
(b) *Acute angle*



(c) *Right angle*



(d) *Obtuse angle*



4. Multiply.

- (a) 
$$\begin{array}{r} 76 \\ \times 23 \\ \hline 7748 \end{array}$$
- (b) 
$$\begin{array}{r} \$536.74 \\ \times 6 \\ \hline \$3220.44 \end{array}$$
- (c) 
$$\begin{array}{r} 85.04 \\ \times 0.9 \\ \hline 76.536 \end{array}$$
- (d) 
$$\begin{array}{r} 447 \\ \times 325 \\ \hline 145\,275 \end{array}$$

5. Divide. *59 R4*

(a)  $8 \overline{)476}$

*193 R2*

(b)  $18 \overline{)3476}$

*8*

(c)  $40 \overline{)320}$

*34*

(d)  $96 \overline{)3264}$

6. How many seconds are in 4 min? *240 s*

7. Copy and complete.

- (a) 1 dm =  $\frac{10}{100}$  cm (b) 4 t =  $\frac{4000}{1000}$  kg (c) 1 L =  $\frac{1000}{1000}$  mL

8. Solve.

- (a)  $N < 10$  (b)  $8 > A$  (c)  $32 - 25 > B$

Chapters 1-7 cumulative review 227

## OBJECTIVE

To review and test selected concepts and skills previously covered

## PACING

Level A All  
Level B All  
Level C All

## USING THE BOOK

This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a large number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic, or, refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1	25
2(a), 2(c)	21
2(b), 2(d)	12
3	48
4(a)	85
4(b)	79
4(c)	94
4(d)	88
5(a), 5(b)	145
5(c)	134
5(d)	139
6	126
7(a)	111
7(b)	122
7(c)	119
8	166

### ANSWERS:

1. (a) Forty-seven decimal four (b) Seven million, three hundred forty-nine thousand, forty-two  
(c) Fifty-eight thousand, three hundred twenty-four (d) Eighty-five decimal four six

8. (a)  $N = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9$  (b)  $A = 0, 1, 2, 3, 4, 5, 6, 7$   
(c)  $B = 0, 1, 2, 3, 4, 5, 6$

# CHAPTER 8 OVERVIEW

This chapter reviews and/or introduces the meaning of fractions, decimals, ratios, and percents. Addition and subtraction of fractions with like and unlike denominators is developed. Equivalence is investigated fully involving fractions, decimals, mixed numerals, and percents. Numerous applications are also presented.

## OBJECTIVES

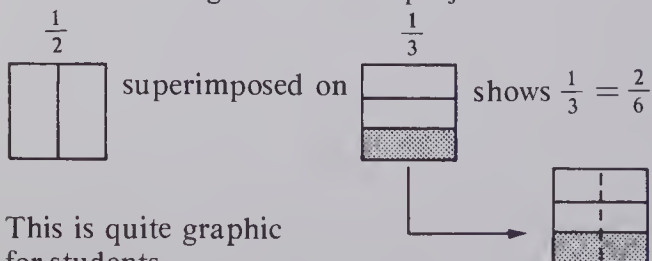
- A To recognize fractional parts of regions and sets and to calculate fractional parts of sets
- B To add and subtract mixed numerals and fractions having like and unlike denominators
- C To identify and generate equivalent fractions and decimal equivalents, including fractions expressed in lowest terms
- D To add, subtract, and multiply decimals
- E To express ratios, identify equivalent ratios, and write ratios as decimals and percents
- F To express percents as ratios and decimals and to determine percentage of a given amount
- G To solve word problems involving fractions, ratios, and percents

## BACKGROUND

Although this chapter is entitled "Fractions", it also uses equivalence relationships to extend the investigations into the use of decimals, ratio, and percent. In looking at all of these concepts within one chapter, the authors' intention is to show that the concepts are closely related and interchangeable when calculating answers to problems. Hence, to determine 50% of 82 the student may have a variety of solutions.

- (a) 50% of 82 is 41                      (b)  $0.5 \times 82 = 41.0$   
or 41
- (c)  $\frac{1}{2}$  of 82                              (d)  $\frac{50}{100} \times 82 = \frac{1}{2} \times 82$   
 $= \frac{1}{2} \times 82$   
 $= 41$

A 10 cm  $\times$  10 cm square is used as an area model for fractions so that common denominators can be illustrated using an overhead projector.



This is quite graphic for students.

Using the multiplication chart (on page 238) to identify equivalent fractions enhances the reasons why if  $\frac{1}{2} = \frac{5}{10}$ , we multiply both numerator and denominator

by 5 because it is also in the "5 times" column from the chart.

Thus,  $\frac{1 \times 5}{2 \times 5} = \frac{5}{10}$  makes more sense.

The definitions of ratio and percent are kept very basic, i.e., ratio is a number comparison; percent is an amount compared to 100.

## MATERIALS

sets of things in two colours  
"fraction pizza pies"  
pop bottles  
numerous 10 cm  $\times$  10 cm squares divided into  $\frac{1}{2}$ 's,  $\frac{1}{3}$ 's,  $\frac{1}{4}$ 's,  $\frac{1}{5}$ 's, and  $\frac{1}{10}$ 's (see page 232)  
acetate copies of the 10 cm  $\times$  10 cm squares for the overhead projector (see above)  
overhead transparencies described on page 233  
multiplication grids (transparencies)  
water-colour markers  
blank number lines  
blank playing cards (Bristol board)  
decimal pocket charts or place-value charts  
graph paper (1 cm grid)  
sports section from local newspaper and also various advertisements

## CAREER AWARENESS

### The Building Contractor [260-261]

The building contractor erects homes complete with streets, sidewalks, and all utilities on land which was originally a farmer's field or vacant lot.

This requires a person with talents in both planning and in working with many diverse people to accomplish goals. The contractor must contact other specialist tradespeople who will install sewers, water-mains, hydro, telephone lines, cable TV, etc. before the foundations are dug. Once the services are in and all the various government agencies have approved the site, the house building can begin.

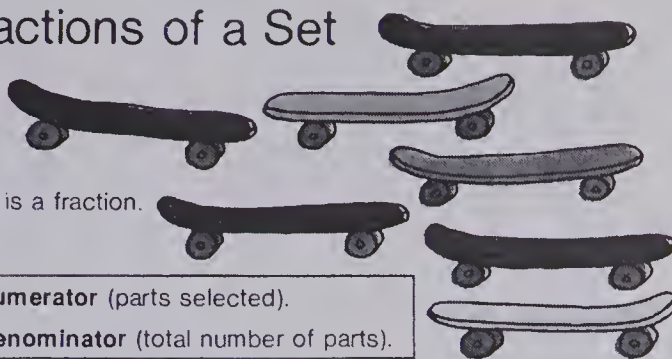
Specialized tradespeople work on specific areas of the project: concrete workers and form builders on concrete basements and slabs; carpenters on frame construction; brick layers, electricians, heating contractors, drywall installers, plumbers, roofers, landscapers, pavers, etc. build the homes and prepare the yards. Throughout this activity, banks or/and insurance companies are involved in financing the large investments required. In the example of 50 homes in the text, between 3 and 4 million dollars might have been involved.

Once the homes are built, or possibly before they are built, the real estate sales force becomes involved in selling the houses to the families who will make them into homes.



## Fractions of a Set

- 4 — number of red skateboards  
7 — total number of skateboards  
 $\frac{4}{7}$  of the skateboards are red.  $\frac{4}{7}$  is a fraction.



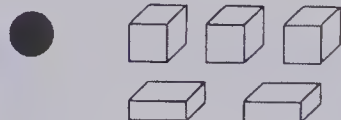
4 is the **numerator** (parts selected).  
7 is the **denominator** (total number of parts).

### Exercises



- How many compact cars? 5  
How many cars in all? 8

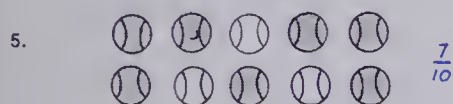
- (a) Write a fraction for the cars which are compact cars.  $\frac{5}{8}$   
(b) Write a fraction for the cars which are full-sized cars.  $\frac{3}{8}$



- How many cubes? 3  
How many boxes in all? 5

- (a) Write a fraction for the boxes which are cubes.  $\frac{3}{5}$   
(b) Write a fraction for the boxes which are not cubes.  $\frac{2}{5}$

Write a fraction for the coloured part of each shape or each set.



7. Write fractions for the uncoloured parts of each shape or set in Exercises 3 through 6.  
(Label the answers 3 (b), 4 (b), 5 (b), 6 (b).) 3.(b)  $\frac{3}{9}$  4.(b)  $\frac{4}{9}$  5.(b)  $\frac{3}{10}$  6.(b)  $\frac{7}{8}$

## OBJECTIVE

To review the fraction concepts

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

numerator, denominator

## MATERIALS

sets of things in two colours, fraction shapes

## BACKGROUND

Some students may have difficulty because of the property of inclusion. First identify how many are in the whole set (denominator) and then identify how many are selected or included (numerator).

## SUGGESTIONS

**Initial Activity** Using the materials listed above, review "equal parts" of whole things and the naming of a fraction. Review "number of things" out of a whole group of similar things and naming a fraction.

$$\frac{\text{numerator}}{\text{denominator}} = \frac{\text{selected equal parts}}{\text{total number of equal parts}}$$

## USING THE BOOK

When referring to the pupil display, have the students identify (a) the number of skateboards (denominator), and (b) the number of skateboards which are red (numerator). Emphasize that  $\frac{4}{7}$  of all the skateboards are red. Repeat to show that  $\frac{3}{7}$  of all the skateboards are *not* red.

You may wish to read through Exercise 7 together to be certain that all students are clear on what is meant.

When the completed Exercises 3 to 6 are being marked, discuss which is the greater fraction, coloured or uncoloured.

## ACTIVITIES

- Have students check their pencils and pens for circular or hexagonal cross sections. What fraction are hexagonal? What fraction are circular?
- Have the students use 8 counters which are a different colour on each side. (Use two colours of gummed

circles if necessary.) Have them shake the counters in a small box or container. Students then write the fraction of the set for each colour showing.

- Repeat activity 2 using:
  - 10 markers
  - 12 markers
  - 15 markers
  - 20 markers.

## OBJECTIVE

To find fractional parts of sets

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

12 pop bottles (preferably clear),  
coloured water (use food colouring)

## BACKGROUND

On this page, we are using unit fractions only (i.e., the numerator is 1) and finding unit fractional parts of whole sets. This relates nicely to division by whole numbers.

## SUGGESTIONS

### Initial Activity

1. Use 8 pop bottles. Ask a student to fill  $\frac{1}{2}$  of them with coloured water.

Record  $\frac{1}{2}$  of 8 = 4  
or  $8 \div 2 = 4$

2. Use 10 pop bottles. Ask a student to fill  $\frac{1}{5}$  of them with coloured water.

Record  $\frac{1}{5}$  of 10 = 2  
or  $10 \div 5 = 2$

3. Using all 12 pop bottles, demonstrate

(a)  $\frac{1}{2}$  of 12 Record as  $\frac{1}{2}$  of 12 = 6  
or  $12 \div 2 = 6$

(b)  $\frac{1}{3}$  of 12 Record as  $\frac{1}{3}$  of 12 = 4  
or  $12 \div 3 = 4$

## USING THE BOOK

Read through the pupil display together. Point out that since all the numerators are *one* in this exercise, we are selecting *one* of the 2 equal groups in 8.

Thus  $\frac{1}{2}$  of 8  
=  $8 \div 2 = 4$

Similarly in the example on the right side of the pupil page, we are selecting *one* of the 5 equal groups of 10.

Thus  $\frac{1}{5}$  of 10  
=  $10 \div 5 = 2$

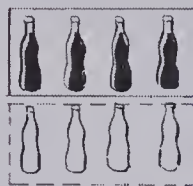
Assign the page. Have the students use the related division question to determine the answers in each case.

Discuss Exercises 1 and 2 to establish the format. In Exercises 9 to 20, the students will have to write the related division questions too.

## ACTIVITIES

1. Let students use playing cards to show the following.

## Parts of Sets



8  
pop bottles.  
 $\frac{1}{2}$  are full.

How many are full?

$$\frac{1}{2} \text{ of } 8 = 4$$

$$8 \div 2 = 4$$

4 bottles are full.



10  
pop bottles.  
 $\frac{1}{5}$  are full.

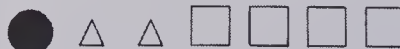
How many are full?

$$\frac{1}{5} \text{ of } 10 = 2$$

$$10 \div 5 = 2$$

2 bottles are full.

### Exercises



6 shapes.

$\frac{1}{3}$  are triangles.

How many are triangles?

$$\frac{1}{3} \text{ of } 6 = \blacksquare 2$$

$$6 \div 3 = \blacksquare 2$$



16 circles.

$\frac{1}{4}$  are coloured.

How many are coloured?

$$\frac{1}{4} \text{ of } 16 = \blacksquare 4$$

$$16 \div 4 = \blacksquare 4$$

Solve.

$$\frac{1}{3} \text{ of } 15 = \blacksquare 5$$

$$15 \div 3 = \blacksquare 5$$

$$4. \frac{1}{2} \text{ of } 18 = \blacksquare 9$$

$$18 \div 2 = \blacksquare 9$$

$$5. \frac{1}{4} \text{ of } 20 = \blacksquare 5$$

$$20 \div 4 = \blacksquare 5$$

$$6. \frac{1}{5} \text{ of } 15 = \blacksquare 3$$

$$15 \div 5 = \blacksquare 3$$

$$7. \frac{1}{4} \text{ of } 24 = \blacksquare 6$$

$$24 \div 4 = \blacksquare 6$$

$$8. \frac{1}{2} \times 100 = \blacksquare 50$$

$$100 \div 2 = \blacksquare 50$$

$$\frac{1}{2} \text{ of } 10 = \blacksquare 5$$

$$\frac{1}{2} \text{ of } 16 = \blacksquare 8$$

$$11. \frac{1}{3} \text{ of } 9 = \blacksquare 3$$

$$12. \frac{1}{3} \text{ of } 21 = \blacksquare 7$$

$$13. \frac{1}{4} \text{ of } 12 = \blacksquare 3$$

$$14. \frac{1}{4} \text{ of } 80 = \blacksquare 20$$

$$15. \frac{1}{5} \text{ of } 25 = \blacksquare 5$$

$$16. \frac{1}{6} \text{ of } 30 = \blacksquare 5$$

$$17. \frac{1}{5} \text{ of } 100 = \blacksquare 20$$

$$18. \frac{1}{10} \text{ of } 30 = \blacksquare 3$$

$$19. \frac{1}{10} \text{ of } 60 = \blacksquare 6$$

$$20. \frac{1}{10} \text{ of } 100 = \blacksquare 10$$

(a) 16 playing cards.

$\frac{1}{2}$  are red.

(b) 20 playing cards.

$\frac{1}{4}$  are black.

(c) 24 playing cards.

$\frac{1}{3}$  are hearts and the rest are spades.

2. Use a red stamp pad, a black stamp pad, and a Happy Face to illustrate:

(a) many " $\frac{1}{2}$  of ..." situations. Write the statements under each illustration.

(b) many " $\frac{1}{3}$  of ..." situations.

(c) many " $\frac{1}{4}$  of ..." situations.

## More Parts of Sets



10  
pop bottles.  
 $\frac{2}{5}$  are full.

How many are full?

$$\frac{2}{5} \text{ of } 10 = 2$$

$$10 \div 5 = 2$$

2 bottles are full.



10  
pop bottles.  
 $\frac{4}{5}$  are full.

How many are full?

$$\frac{4}{5} \text{ of } 10 = 4$$

$$(10 \div 5) \times 4 = 4$$

4 bottles are full.

Think:

$$\frac{2}{5} \text{ is twice}$$

as many as

$$\frac{1}{5}$$

### Exercises



12 shapes.

$\frac{2}{3}$  are triangles.

How many are triangles?

$$\frac{2}{3} \times 12 = \blacksquare 8$$

$$(12 \div 3) \times 2 = \blacksquare 8$$

Solve.

4.  $\frac{2}{5}$  of 15 =  $\blacksquare 6$

$$(15 \div 5) \times 2 = \blacksquare 6$$

7.  $\frac{3}{4}$  of 24 =  $\blacksquare 18$

$$(24 \div 4) \times 3 = \blacksquare 18$$

10.  $\frac{2}{3}$  of 6 =  $\blacksquare 4$

13.  $\frac{3}{4}$  of 36 =  $\blacksquare 27$



8 squares.

$\frac{3}{4}$  are coloured.

How many are coloured?

$$\frac{3}{4} \text{ of } 8 = \blacksquare 6$$

$$(8 \div 4) \times 3 = \blacksquare 6$$

5.  $\frac{3}{5}$  of 15 =  $\blacksquare 9$

$$(15 \div 5) \times 3 = \blacksquare 9$$

8.  $\frac{2}{3}$  of 21 =  $\blacksquare 14$

$$(21 \div 3) \times 2 = \blacksquare 14$$

11.  $\frac{2}{3}$  of 15 =  $\blacksquare 10$

14.  $\frac{5}{6}$  of 12 =  $\blacksquare 10$



10 squares.

$\frac{4}{5}$  of the 10 squares are coloured.

How many are coloured?

$$\frac{4}{5} \text{ of } 10 = \blacksquare 8$$

$$(10 \div 5) \times 4 = \blacksquare 8$$

6.  $\frac{4}{5}$  of 15 =  $\blacksquare 12$

$$(15 \div 5) \times 4 = \blacksquare 12$$

9.  $\frac{3}{5}$  of 25 =  $\blacksquare 15$

$$(25 \div 5) \times 3 = \blacksquare 15$$

12.  $\frac{3}{4}$  of 20 =  $\blacksquare 15$

15.  $\frac{7}{10}$  of 30 =  $\blacksquare 21$

Fractional parts of sets 231

## OBJECTIVE

To find fractional parts of sets

## PACING

Level A All

Level B All

Level C All

## MATERIALS

12 pop bottles (preferably clear),  
coloured water

## BACKGROUND

In this exercise we are extending the ideas used in the previous exercise and building the understanding that  $\frac{2}{5}$  is twice as much as  $\frac{1}{5}$ , and that  $\frac{3}{4}$  is three times as much as  $\frac{1}{4}$ .

## SUGGESTIONS

**Initial Activity** Using 12 pop bottles, have a student fill  $\frac{1}{4}$  of the 12 bottles with coloured water. Record the answer as  $\frac{1}{4}$  of 12 = 3. Ask a second student to fill another  $\frac{1}{4}$  of the 12 bottles with coloured water. We now have  $\frac{2}{4}$  of the 12 bottles filled. Record this as  $\frac{2}{4}$  of 12 = 6. Ask a third student to fill another  $\frac{1}{4}$  of the 12 bottles with coloured water. We now have  $\frac{3}{4}$  of 12 bottles filled. Record this as  $\frac{3}{4}$  of 12 = 9.

Under each of the previous recordings show:

$$\frac{1}{4} \text{ of } 12 = 3 \quad \frac{2}{4} \text{ of } 12 = 6$$

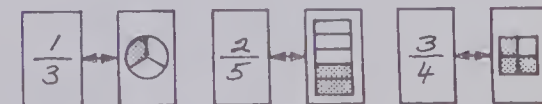
$$(12 \div 4) \times 1 = 3 \quad (12 \div 4) \times 2 = 6$$

$$\frac{3}{4} \text{ of } 12 = 9$$

$$(12 \div 4) \times 3 = 9$$

This is because  $\frac{2}{4}$  is simply 2 groups of  $\frac{1}{4}$  and  $\frac{3}{4}$  is simply 3 groups of  $\frac{1}{4}$ .

2. See "Concentration" as described in the Activity Reservoir. Have the students help prepare cards like these.



3. Use commercially prepared stamps (or stamps made from potatoes or carrots and water-soluble paint) to illustrate expressions like these.

(a)  $\frac{2}{3} \times 12 = 8$  (b)  $\frac{1}{2} \times 10 = 5$

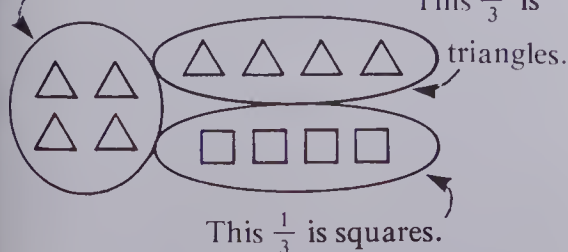
(c)  $\frac{3}{4} \times 8 = 6$

## USING THE BOOK

Read through the pop bottle examples at the top of the pupil page. Show the relationship between the number of each set of bottles which are full and the numerical calculations underneath, just as was done in the Initial Activity.

Draw the twelve shapes shown in Exercise 1 on the chalkboard. Identify each of the parts of the set like this.

This  $\frac{1}{3}$  is triangles.



This  $\frac{1}{3}$  is triangles.

This  $\frac{1}{3}$  is squares.

Thus,  $\frac{2}{3}$  are triangles.

$$\frac{2}{3} \text{ of } 12 = 8 \text{ and } (12 \div 3) \times 2 = 8$$

This shows 4 in each third.

Assign the rest of the exercises. In Exercises 10 to 15, the students will have to think of the related division statements.

## ACTIVITIES

1. Use choral rhythmic drill to show this concept.

(a)  $\frac{1}{5}$  of 20 is 4 (b)  $\frac{1}{3}$  of 18 is 6 ...

$\frac{2}{5}$  of 20 is 8 (c)  $\frac{1}{4}$  of 16 is 4 ...

$\frac{3}{5}$  of 20 is 12 (d)  $\frac{1}{10}$  of 30 is 3 ...

$\frac{4}{5}$  of 20 is 16

$\frac{5}{5}$  of 20 is 20



## OBJECTIVES

To compare fractions  
To use the signs  $>$ ,  $<$ , and  $=$

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

$>$ ,  $<$ , and  $=$

## MATERIALS

overhead projector, acetate, screen

## RELATED AIDS

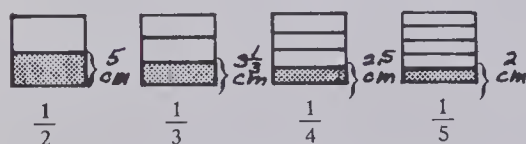
HMS — DM56 and DM57.

## BACKGROUND

Because the same area is divided into more equal parts, each part is smaller.

## SUGGESTIONS

**Initial Activity** Prepare these 10 cm  $\times$  10 cm squares using clear acetate. Shaded areas are as shown (see DM56).



Show that  $\frac{1}{2}$  is greater than  $\frac{1}{3}$ ,  $\frac{1}{4}$ , or  $\frac{1}{5}$  on the overhead using the shaded areas.

Draw a fraction line on the chalk-board showing 0,  $\frac{1}{5}$ ,  $\frac{1}{4}$ ,  $\frac{1}{3}$ ,  $\frac{1}{2}$ , and 1. Show that  $\frac{1}{2}$  is to the right of all the others (i.e.,  $\frac{1}{3}$ ,  $\frac{1}{4}$ , and  $\frac{1}{5}$ ) on the number line and is, therefore, greater.

## USING THE BOOK

Review the meanings of the symbols  $>$ ,  $<$ , and  $=$ . Ask: "Which fractions in the display are less than  $\frac{1}{3}$ ? [ $\frac{1}{4} < \frac{1}{3}$  and  $\frac{1}{5} < \frac{1}{3}$ ]"

Have the pupils look at the number lines and complete this statement:  $\frac{2}{3} > \frac{1}{2}$ . This means  $\frac{2}{3}$  is to the right of all of the following.

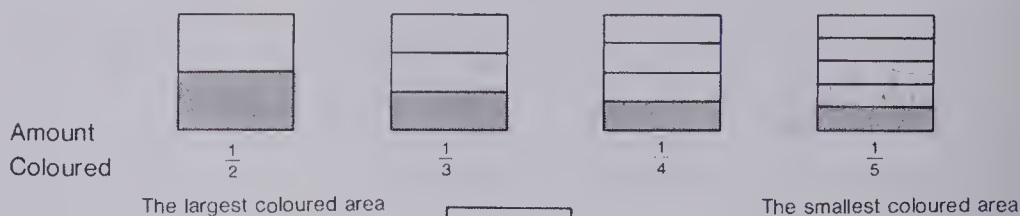
$\frac{2}{3} > \frac{3}{5}$	$\frac{2}{3} > \frac{1}{2}$ or $\frac{2}{4}$	$\frac{2}{3} > \frac{2}{5}$
$\frac{2}{3} > \frac{1}{3}$	$\frac{2}{3} > \frac{1}{4}$	$\frac{2}{3} > \frac{1}{5}$

In Exercises 1 to 8, encourage the pupils to discover as many correct answers as they can.

## ACTIVITIES

1. See the "Fraction Fishing" game

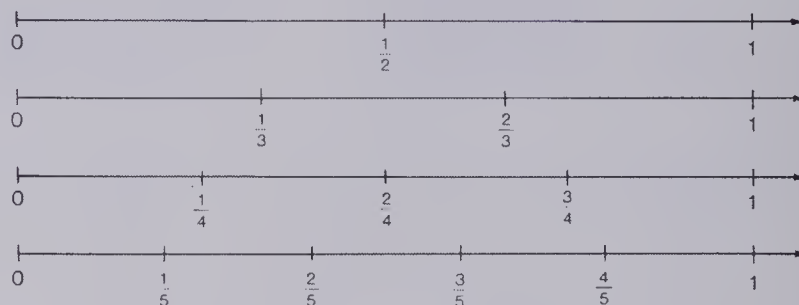
## Comparing Halves, Thirds, Quarters, and Fifths



$$\frac{1}{2} > \frac{1}{5}$$

You can also see that  $\frac{1}{3} > \frac{1}{4}$ ,  $\frac{1}{3} > \frac{1}{5}$ , and  $\frac{1}{4} > \frac{1}{5}$ .

This can be shown on a number line.



$>$  means is greater than.  
 $<$  means is less than.  
 $=$  means is equal to.

### Exercises

Using the number lines above, finish these statements so they are true statements.

- $\frac{1}{2} > \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{2}{5}$
  - $\frac{1}{3} > \frac{1}{4}, \frac{1}{5}$
  - $\frac{1}{4} > \frac{1}{5}$
  - $\frac{2}{5} > \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$
  - $\frac{1}{2} < \frac{2}{3}, \frac{3}{4}, \frac{3}{5}, \frac{4}{5}$
  - $\frac{3}{5} < \frac{2}{3}, \frac{3}{4}, \frac{4}{5}$
  - $\frac{1}{2} = \frac{2}{4}$
  - $\frac{2}{3} < \frac{3}{4}, \frac{4}{5}$
  - $\frac{3}{5} \bullet \frac{3}{4} <$
  - $\frac{3}{4} \bullet \frac{4}{5} <$
  - $\frac{1}{2} \bullet \frac{2}{4} =$
  - $\frac{4}{5} \bullet \frac{2}{3} >$
13. Place these fractions in order from smallest to largest.  
 $\frac{1}{5}, \frac{1}{3}, \frac{4}{5}, \frac{1}{2}, \frac{1}{4}, \frac{3}{4}, \frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{2}{4}, \frac{3}{4}, \frac{4}{5}$

listed under "Fraction Cards" as described in the Activity Reservoir.

2. See "Dominoes" as described in the Activity Reservoir.

3. Have the pupils prepare a set of fraction cards, each card showing a fraction from this group:  $\frac{1}{2}, \frac{1}{3}, \frac{2}{3}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}$ . Two to four players turn all ten cards face down on a desk. One player covers his or her eyes while four cards are turned face up. On uncovering his or her eyes, the player has five seconds to identify the least fraction showing. A correct answer

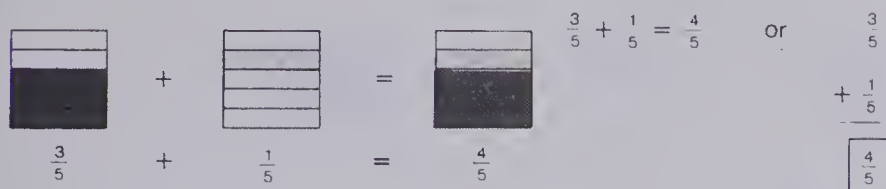
yields a score equal to the denominator of the least fraction.

Players take turns covering their eyes and then identifying the least fraction. The player with the most points when five rounds have been completed is the winner.

**Variations:**

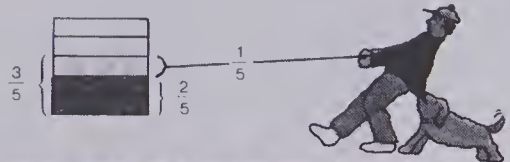
- Identify the greatest fraction showing.
- Place four cards in order, least to greatest.
- Play as above with an expanded deck of cards.

# Adding and Subtracting Fractions



$$\frac{3}{5} - \frac{1}{5} = \frac{2}{5}$$

$$\frac{3}{5} - \frac{1}{5} = \frac{2}{5}$$



When the denominators are the same *add* or *subtract* the numerators.

## Exercises

Add.

1.  $\frac{2}{5} + \frac{2}{5} = \frac{4}{5}$     2.  $\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$     3.  $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$     4.  $\frac{1}{2} + \frac{1}{2} = \frac{2}{2}$     5.  $\frac{1}{6} + \frac{5}{6} = \frac{6}{6}$

6.  $\frac{3}{8} + \frac{4}{8} = \frac{7}{8}$     7.  $\frac{3}{10} + \frac{5}{10} = \frac{8}{10}$     8.  $\frac{2}{7} + \frac{3}{7} = \frac{5}{7}$     9.  $\frac{5}{8} + \frac{1}{8} = \frac{6}{8}$     10.  $\frac{2}{10} + \frac{3}{10} = \frac{5}{10}$

Subtract.

11.  $\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$     12.  $\frac{3}{4} - \frac{1}{4} = \frac{2}{4}$     13.  $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$     14.  $\frac{2}{2} - \frac{1}{2} = \frac{1}{2}$     15.  $\frac{5}{6} - \frac{3}{6} = \frac{2}{6}$

16.  $\frac{7}{8} - \frac{3}{8} = \frac{4}{8}$     17.  $\frac{9}{10} - \frac{7}{10} = \frac{2}{10}$     18.  $\frac{6}{7} - \frac{2}{7} = \frac{4}{7}$     19.  $\frac{5}{8} - \frac{1}{8} = \frac{4}{8}$     20.  $\frac{7}{10} - \frac{3}{10} = \frac{4}{10}$

Add or subtract. (Watch the operation signs!)

21.  $\frac{6}{7} - \frac{4}{7} = \frac{2}{7}$     22.  $\frac{2}{9} + \frac{5}{9} = \frac{7}{9}$     23.  $\frac{7}{10} + \frac{2}{10} = \frac{9}{10}$     24.  $\frac{3}{4} - \frac{2}{4} = \frac{1}{4}$     25.  $\frac{3}{10} + \frac{7}{10} = \frac{10}{10}$

26.  $\frac{8}{10} - \frac{5}{10} = \frac{3}{10}$     27.  $\frac{3}{5} + \frac{1}{5} = \frac{4}{5}$     28.  $\frac{5}{6} - \frac{4}{6} = \frac{1}{6}$     29.  $\frac{8}{9} - \frac{5}{9} = \frac{3}{9}$     30.  $\frac{5}{10} + \frac{4}{10} = \frac{9}{10}$

Addition and subtraction of like fractions 233

## OBJECTIVE

To add and subtract fractions with like denominators (sums less than or equal to one)

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

overhead transparencies of the following



If available, use different colours for each fifth.

## RELATED AIDS

HMS — DM56.  
BFA COMP LAB II — 65, 66.  
BFA PROB. SOLVING LAB II — 133, 134.

## SUGGESTIONS

**Initial Activity** Use "sandwiched" overhead transparencies to show  $\frac{3}{5} + \frac{1}{5} = \frac{4}{5}$  and record this on the chalkboard.

Point out that the denominator of the answer is the same (fifths) and that we added the numerators. Likewise,  $\frac{2}{5} + \frac{2}{5}$  would be  $\frac{4}{5}$  because the denominators are alike and we have four fifths altogether.

Repeat for other situations, such as  $\frac{3}{5} - \frac{1}{5} = \frac{2}{5}$ .

## USING THE BOOK

Discuss the two situations pictured at the top of the pupil page. If necessary, clarify what the boy and dog are doing (i.e., removing a fifth) and what will be left when they are finished (two fifths).

Stress the rule in the box in the pupil display. You may wish to place it on a bulletin board somewhere in the classroom for future reference.

Assign the exercises. Remind students to read the instructions carefully.

## ACTIVITIES

1. Have the students write as many addition statements as they can whose sums are as follows.

(a)  $\frac{5}{8}$     (b)  $\frac{7}{10}$     (c)  $\frac{11}{12}$

2. Have the students write 3 subtraction statements whose

differences are as follows.

(a)  $\frac{3}{5}$     (b)  $\frac{1}{8}$     (c)  $\frac{3}{10}$

3. Have the students write as many true statements as they can using addition signs and subtraction signs so that the answers are as follows.

(a)  $\frac{4}{8}$     (b)  $\frac{9}{10}$     (c)  $\frac{3}{4}$

## OBJECTIVE

To add like portions and express answers as improper fractions, mixed numerals, or one

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

overhead projector and screen, transparencies of:



$\frac{3}{4}$  and  $\frac{1}{4}$  on 10 cm by 10 cm squares

## RELATED AIDS

HMS — DM56.  
BFA COMP LAB II — 67, 68.

## BACKGROUND

This whole exercise can be done without changing improper fractions to mixed fractions.

## SUGGESTIONS

**Initial Activity** Demonstrate that  $\frac{3}{4} + \frac{1}{4} = \frac{4}{4}$  or 1 using the overhead transparencies. Relate  $\frac{3}{4} + \frac{1}{4} = \frac{4}{4}$  to the previous lesson when numerators were added. Mention that  $\frac{4}{4}$  equals one whole.

## USING THE BOOK

Show that  $\frac{2}{3} + \frac{2}{3} = \frac{4}{3}$  by referring to the display at the top of the pupil page. Remind students that since the denominators are alike, they simply add the numerators.

Assign the exercises and have the students express answers as improper fractions. When the students are finished with the exercises, discuss how  $\frac{3}{3} = 1$ ,  $\frac{5}{5} = 1$ , etc. and that  $\frac{4}{3}$  is  $1\frac{1}{3}$  and  $\frac{7}{2}$  is  $3\frac{1}{2}$ .

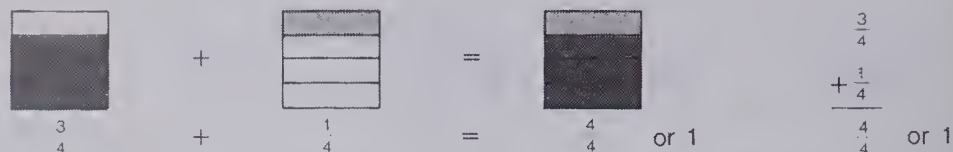
Have students go back to the exercises and express all improper fraction answers as mixed numerals or whole numbers. Stress that either answer is acceptable, e.g.,  $\frac{5}{3}$  or  $1\frac{2}{3}$ . Mark the work accepting either the improper fraction answer or the mixed numeral or both.

## ACTIVITIES

1. "Whole Number Snap" Make up 40 cards with improper fractions on them. Be sure to include the following

## Sums Equal to or Greater Than One

Sometimes the sum equals one.



Sometimes the sum is greater than one.

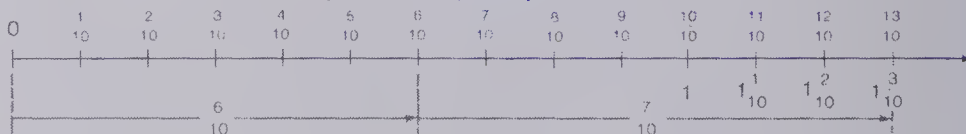


### Exercises

Add.

1.  $\frac{3}{4} + \frac{1}{4}$  or  $\frac{4}{4}$  2.  $\frac{1}{2} + \frac{1}{2}$  or 1 3.  $\frac{4}{5} + \frac{1}{5}$  or  $\frac{5}{5}$  4.  $\frac{5}{6} + \frac{1}{6}$  or  $\frac{6}{6}$  5.  $\frac{4}{7} + \frac{3}{7}$  or  $\frac{7}{7}$
6.  $\frac{7}{8} + \frac{1}{8}$  or  $\frac{8}{8}$  7.  $\frac{3}{5} + \frac{2}{5}$  or  $\frac{5}{5}$  8.  $\frac{5}{9} + \frac{4}{9}$  or  $\frac{9}{9}$  9.  $\frac{7}{10} + \frac{3}{10}$  or  $\frac{10}{10}$  10.  $\frac{1}{3} + \frac{2}{3}$  or 1
11.  $\frac{3}{4} + \frac{1}{4}$  or  $\frac{4}{4}$  12.  $\frac{6}{8} + \frac{2}{8}$  or  $\frac{8}{8}$  13.  $\frac{2}{7} + \frac{5}{7}$  or  $\frac{7}{7}$  14.  $\frac{3}{10} + \frac{7}{10}$  or  $\frac{10}{10}$  15.  $\frac{4}{6} + \frac{2}{6}$  or  $\frac{6}{6}$
16.  $\frac{3}{10} + \frac{7}{10}$  or  $\frac{10}{10}$  17.  $\frac{7}{8} + \frac{1}{8}$  or  $\frac{8}{8}$  18.  $\frac{8}{9} + \frac{1}{9}$  or  $\frac{9}{9}$  19.  $\frac{2}{5} + \frac{3}{5}$  or  $\frac{5}{5}$  20.  $\frac{9}{10} + \frac{1}{10}$  or  $\frac{10}{10}$
21.  $\frac{3}{6} + \frac{3}{6}$  or  $\frac{6}{6}$  22.  $\frac{5}{9} + \frac{4}{9}$  or  $\frac{9}{9}$  23.  $\frac{7}{8} + \frac{1}{8}$  or  $\frac{8}{8}$  24.  $\frac{5}{10} + \frac{5}{10}$  or  $\frac{10}{10}$  25.  $\frac{8}{10} + \frac{2}{10}$  or  $\frac{10}{10}$

26. Use this number line to add  $\frac{6}{10}$  and  $\frac{7}{10}$  or  $\frac{13}{10}$



234 Addition of like fractions: sums greater than one

in your selection of 40 cards:

$\frac{2}{2}, \frac{4}{2}, \frac{3}{3}, \frac{6}{3}, \frac{9}{3}, \frac{4}{4}, \frac{12}{4}, \frac{5}{5}, \frac{10}{5}, \frac{20}{5}, \frac{6}{6}, \frac{18}{6}, \frac{8}{8}, \frac{16}{8}, \frac{24}{8}, \frac{9}{9}, \frac{18}{9}, \frac{10}{10}, \frac{20}{10}$ , and  $\frac{30}{10}$ .

Cards are placed in a pile and turned over one at a time. If the improper fraction has a whole number equivalent, a player calls "Snap". If the player then states the whole number equivalent, he or she wins the card. For the cards that have a mixed numeral equivalent, the first person to state

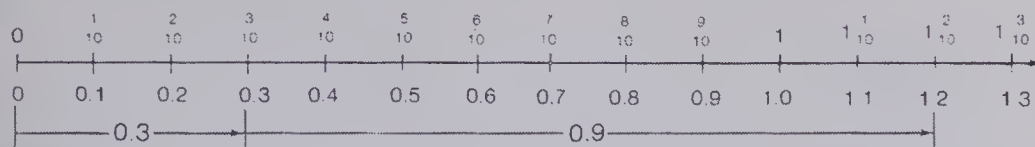
the equivalent wins the card. A person who says "Snap" may not win this card. The player with the most cards after all have been turned over wins. *Note:* A referee may have to be appointed. That person could turn over the cards.

2. Have the students write as many fractions for the following as they can.

(a) 2 (b) 3 (c)  $1\frac{1}{2}$



# Fractions and Decimals



This number line shows fraction and decimal equivalents.

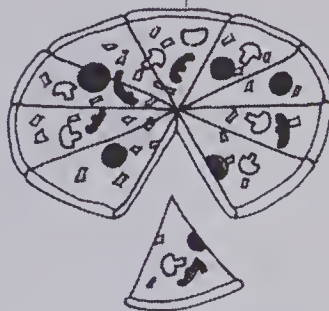
$$\frac{3}{10} = 0.3$$

$$\frac{9}{10} = 0.9$$

$$\text{and } 1\frac{2}{10} = 1.2$$

0.9 is read "zero decimal nine", 1.2 is read "one decimal two".

$$0.3 + 0.9 = 1.2 \quad \text{or} \quad \begin{array}{r} 0.3 \\ + 0.9 \\ \hline 1.2 \end{array} \quad \text{or} \quad \begin{array}{r} \frac{3}{10} \\ + \frac{9}{10} \\ \hline \frac{12}{10} \end{array} \quad \text{or } 1\frac{2}{10} \text{ or } 1.2$$



## Exercises

Write decimal equivalents for each.

1.  $\frac{2}{10}$  0.2    2.  $\frac{7}{10}$  0.7    3. 1  $\frac{0}{10}$  1.0    4.  $1\frac{1}{10}$  1.1    5.  $1\frac{3}{10}$  1.3

Write fraction equivalents for each decimal

6. 0.3  $\frac{3}{10}$     7. 0.5  $\frac{5}{10}$     8. 0.9  $\frac{9}{10}$     9. 1.0 1    10. 1.2  $1\frac{2}{10}$

Add.

11.  $\begin{array}{r} 0.8 \\ + 0.3 \\ \hline 1.1 \end{array}$     12.  $\begin{array}{r} 0.5 \\ + 0.2 \\ \hline 0.7 \end{array}$     13.  $\begin{array}{r} 0.7 \\ + 0.9 \\ \hline 1.6 \end{array}$     14.  $\begin{array}{r} 0.9 \\ + 0.8 \\ \hline 1.7 \end{array}$     15.  $\begin{array}{r} 0.6 \\ + 0.5 \\ \hline 1.1 \end{array}$

Subtract.

16.  $\begin{array}{r} 0.8 \\ - 0.5 \\ \hline 0.3 \end{array}$     17.  $\begin{array}{r} 0.7 \\ - 0.2 \\ \hline 0.5 \end{array}$     18.  $\begin{array}{r} 1.3 \\ - 0.8 \\ \hline 0.5 \end{array}$     19.  $\begin{array}{r} 1.6 \\ - 0.3 \\ \hline 1.3 \end{array}$     20.  $\begin{array}{r} 1.5 \\ - 0.9 \\ \hline 0.6 \end{array}$

Add.

- ★ 21.  $0.7 + \frac{9}{10}$     ★ 22.  $\frac{3}{10} + 1.2$     ★ 23.  $\frac{9}{10} + 0.9$     ★ 24.  $\frac{8}{10} + 3.2$     ★ 25.  $1\frac{2}{10} + 2.5$

Fraction and decimal equivalents 235

## ANSWERS:

21. 1.6 or  $1\frac{6}{10}$     22. 1.5 or  $1\frac{5}{10}$     23. 1.8 or  $1\frac{8}{10}$     24. 4.0 or 4    25. 3.7 or  $3\frac{7}{10}$

## ACTIVITIES

1. Use a blank number line with 22 equal graduations and cards with 0.1 through 2.0 written on them. 0.1, 0.2, 0.3, ..., 2.0.



Have the students choose 5 cards at random and place each in its proper place on the tenths number line.

2. Using the cards from Activity 1, have the students:

- (a) choose 3 cards at random. Write down the decimals in columns and calculate the sum.  
(b) choose 2 cards at random. Subtract the smaller amount from the larger amount.

- (c) choose 3 cards at random. Add the two largest decimals and subtract the smallest decimal from this sum.

Repeat each of these activities 4 or 5 times. Record all calculations in a workbook.

3. Play "Concentration" as described in the Activity Reservoir. Use cards such as:

$$\frac{8}{10} \leftrightarrow 0.8$$

$$1\frac{7}{10} \leftrightarrow 1.7$$

$$\frac{12}{10} \leftrightarrow 1.2$$

## OBJECTIVES

- To determine fraction and decimal equivalents  
To add and subtract decimals

## PACING

- Level A 1-20  
Level B 1-20  
Level C All

## VOCABULARY

decimal equivalents

## MATERIALS

number line graduated in tenths

## RELATED AIDS

CALC. W/BK — 46.

## BACKGROUND

Decimals less than one are written as: 0.7 or 0.13 or 0.487

and should be read as "zero decimal seven" not "decimal seven".

## SUGGESTIONS

**Initial Activity** Using a tenths number line show:

- (a) counting by tenths to 2  
(b) decimal and fraction equivalents  
(c) adding on a number line.

## USING THE BOOK

Read through the display at the top of the pupil page, discussing how adding  $0.3 + 0.9$  is done on a number line and in column format.

Assign the exercises and discuss them when completed. Make sure that the decimal amounts are read correctly.

## OBJECTIVE

To find fraction and decimal equivalents

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

large place-value chart as shown on the pupil page, 20 cards with digits 0 to 9 on them (2 of each)

## RELATED AIDS

HMS — DM58.  
CALC. W/BK — 44.

## BACKGROUND

Style: whenever a decimal fraction is less than one, the zero is written in the one's place, e.g., 0.3, 0.37, 0.372, etc.

## SUGGESTIONS

**Initial Activity** Using the place-value chart and cards, show some decimal amounts of money.

**Examples**

\$0.75 means 75¢ or  $\frac{75}{100}$  of a dollar.

\$0.5 or \$0.50 means 50¢ or  $\frac{50}{100}$  of a dollar (or  $\frac{1}{2}$  of a dollar).

\$0.05 means 5¢ or  $\frac{5}{100}$  of a dollar.

## USING THE BOOK

Discuss the examples in the pupil display with the class to establish that the location of the last non-zero digit determines the denominator of the fractional equivalent.

**Example**

0.026 means  $\frac{26}{1000}$  because the 6 is in the thousandth's column.

The answers for Exercises 2, 3, 4, 12, and 13 are in the back of the student text for those who wish to check their progress.

## ACTIVITIES

1. Have the students play "Biggest and Smallest". Using a place-value chart and 20 cards showing 2 each of 0 to 9, do the following and record the results in your workbook.

- Choose three cards at random.
- Arrange the three cards on the place-value chart to make the greatest decimal fraction that you can which is less than one. Record this decimal.
- Rearrange these cards on the place-value chart to make the least decimal fraction that is less than one. Record this decimal.

## Tenths, Hundredths, and Thousandths

thousands	hundreds	tens	ones	tenths	hundredths	thousandths
			0	3		
			0	3	7	
			0	3	7	2
			0	0	9	
			0	0	0	5
			0	0	2	6

0.3 means 3 tenths or  $\frac{3}{10}$ .

0.37 means 37 hundredths or  $\frac{37}{100}$ .

0.372 means 372 thousandths or  $\frac{372}{1000}$ .

0.09 means 9 hundredths or  $\frac{9}{100}$ .

0.005 means 5 thousandths or  $\frac{5}{1000}$ .

0.026 means 26 thousandths or  $\frac{26}{1000}$ .

### Exercises

Express each as a fraction.

1.  $0.72 = \frac{72}{100}$

2.  $0.13 = \frac{13}{100}$

3.  $0.716 = \frac{716}{1000}$

4.  $0.25 = \frac{25}{100}$

5.  $0.592 = \frac{592}{1000}$

6.  $0.159 = \frac{159}{1000}$

7.  $0.043 = \frac{43}{1000}$

8.  $0.407 = \frac{407}{1000}$

9.  $0.006 = \frac{6}{1000}$

10.  $0.652 = \frac{652}{1000}$

Express each as a decimal.

11.  $\frac{56}{100} = 0.56$

12.  $\frac{637}{1000} = 0.637$

13.  $\frac{5}{10} = 0.5$

14.  $\frac{193}{1000} = 0.193$

15.  $\frac{8}{100} = 0.08$

16.  $\frac{83}{100} = 0.83$

17.  $\frac{382}{1000} = 0.382$

18.  $\frac{75}{1000} = 0.075$

19.  $\frac{9}{1000} = 0.009$

20.  $\frac{38}{1000} = 0.038$

- Write the fraction equivalent for each.
  - Repeat parts (a), (b), and (c) three times.
  - Add your three greatest decimal fractions. Compare your sums with classmates. Who has the greatest sum? the least?
- See "The P.V. Game" in the Activity Reservoir.
  - See the "Fraction Cards" ideas in the Activity Reservoir.

## Tune Up

Add.

1. $\begin{array}{r} 7.4 \\ +9.3 \\ \hline 16.7 \end{array}$	2. $\begin{array}{r} 8.67 \\ +0.15 \\ \hline 8.82 \end{array}$	3. $\begin{array}{r} 7.01 \\ +4.37 \\ \hline 11.38 \end{array}$	4. $\begin{array}{r} 19.19 \\ + 2.76 \\ \hline 21.95 \end{array}$	5. $\begin{array}{r} 0.95 \\ +0.81 \\ \hline 1.76 \end{array}$
--	--	---	---	--

Subtract.

6. $\begin{array}{r} 0.9 \\ -0.4 \\ \hline 0.5 \end{array}$	7. $\begin{array}{r} 0.93 \\ -0.77 \\ \hline 0.16 \end{array}$	8. $\begin{array}{r} 0.83 \\ -0.27 \\ \hline 0.56 \end{array}$	9. $\begin{array}{r} 1.93 \\ -1.69 \\ \hline 0.24 \end{array}$	10. $\begin{array}{r} 14.12 \\ - 7.85 \\ \hline 6.27 \end{array}$
---	--	--	--	---

Add.

11. $\begin{array}{r} 16.07 \\ 12.31 \\ +51.28 \\ \hline 79.66 \end{array}$	12. $\begin{array}{r} 9.35 \\ 12.08 \\ +29.26 \\ \hline 50.69 \end{array}$	13. $\begin{array}{r} \$14.99 \\ 36.25 \\ +29.50 \\ \hline \$80.74 \end{array}$	14. $\begin{array}{r} \$235.79 \\ 127.03 \\ +391.52 \\ \hline \$754.34 \end{array}$	15. $\begin{array}{r} \$500.75 \\ 14.89 \\ + 5.17 \\ \hline \$520.81 \end{array}$
---	--	---	---	---

Subtract.

16. $\begin{array}{r} 12.79 \\ - 5.34 \\ \hline 7.45 \end{array}$	17. $\begin{array}{r} 89.07 \\ -43.81 \\ \hline 45.26 \end{array}$	18. $\begin{array}{r} 597.52 \\ - 39.79 \\ \hline 557.73 \end{array}$	19. $\begin{array}{r} \$98.17 \\ - 35.84 \\ \hline \$62.33 \end{array}$	20. $\begin{array}{r} \$385.09 \\ - 137.93 \\ \hline \$247.16 \end{array}$
---	--	---	---	--

Add.

21. $\begin{array}{r} \$12.85 \\ 7.23 \\ 1.79 \\ + 4.36 \\ \hline \$26.23 \end{array}$	22. $\begin{array}{r} \$17.27 \\ 87.35 \\ 46.29 \\ +75.02 \\ \hline \$225.93 \end{array}$	23. $\begin{array}{r} \$358.07 \\ 209.23 \\ 465.39 \\ +148.71 \\ \hline \$1181.40 \end{array}$	24. $\begin{array}{r} \$875.99 \\ 27.03 \\ 9.75 \\ + 80.29 \\ \hline \$993.06 \end{array}$	25. $\begin{array}{r} \$ 17.05 \\ 449.72 \\ 300.00 \\ + 58.63 \\ \hline \$825.40 \end{array}$
--	---	--	--	---

Multiply.

26. $\begin{array}{r} 2.78 \\ \times 0.4 \\ \hline 1.112 \end{array}$	27. $\begin{array}{r} 41.3 \\ \times 0.5 \\ \hline 20.65 \end{array}$	28. $\begin{array}{r} \$12.89 \\ \times 7 \\ \hline \$90.23 \end{array}$	29. $\begin{array}{r} \$9.75 \\ \times 0.12 \\ \hline \$1.17 \end{array}$	30. $\begin{array}{r} \$75.50 \\ \times 0.9 \\ \hline \$67.95 \end{array}$
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## OBJECTIVE

To review and practise the following skills: adding and subtracting decimal fractions; multiplying by units, tenths, and hundredths

## PACING

Level A 1-10, 11-13, 16-18, 26  
 Level B 3-10, 12, 15, 17-20, 23-25, 26-30  
 Level C 4, 5, 9, 10, 12, 14, 15, 17-20, 23-25, 26-30

## SUGGESTIONS

**Initial Activity** Review addition and subtraction of fractions using graph paper to maintain place value.

## USING THE BOOK

Assign the exercises based on the pacing suggested above. If a student makes an error in a row, all the questions in that row may be done for practice. The following chart shows where the specific topics were presented in the text.

Exercise	Page
1-25	7, 11, 16
26-28, 30	94
29	95



## OBJECTIVE

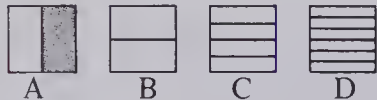
To determine equivalent fractions using a multiplication chart

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

overhead transparencies of multiplication chart, 10 cm square grids like these:



## RELATED AIDS

HMS — DM56.

## SUGGESTIONS

**Initial Activity** Use the overhead transparencies described in the Materials section to show the various equivalent fractions. Note that transparency:

A is constant and equals  $\frac{1}{2}$ .

B on A shows that  $\frac{2}{4} = \frac{1}{2}$ .

C on A shows that  $\frac{4}{8} = \frac{1}{2}$ .

D on A shows that  $\frac{6}{12} = \frac{1}{2}$ .

## USING THE BOOK

Use the transparency multiplication chart to show that these fractions equivalent to  $\frac{1}{2}$  appear in the multiplication chart opposite the 1 and 2 rows.

$$\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{6}{12}$$

Ask: "What other fractions are equivalent to  $\frac{1}{2}$ ?"

$$\left[ \frac{3}{6}, \frac{5}{10}, \frac{7}{14}, \frac{8}{16}, \frac{9}{18}, \frac{10}{20} \right]$$

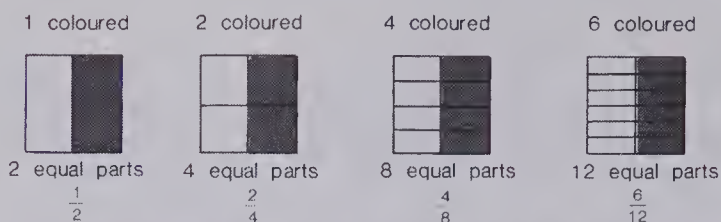
Show that  $\frac{3}{6}$  is in the 3 times column so  $\frac{1 \times 3}{2 \times 3} = \frac{3}{6}$ .

Show fractions equivalent to  $\frac{3}{8}$ . Discuss.

Show fractions equivalent to  $\frac{7}{5}$ . Discuss, stressing that just as in the other cases, both the numerator and denominator are multiplied by the same amount.

Assign the exercises to be done using the multiplication chart. The answers for Exercises 3 and 20 are in the back of the student's text.

## Equivalent Fractions



All these fractions are **equivalent** because the same area is shaded.

Multiplication Chart

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

On the multiplication chart:

$$\frac{1}{2} = \frac{2}{4} \text{ in the 2 times column.}$$

$$\frac{1}{2} = \frac{4}{8} \text{ in the 4 times column.}$$

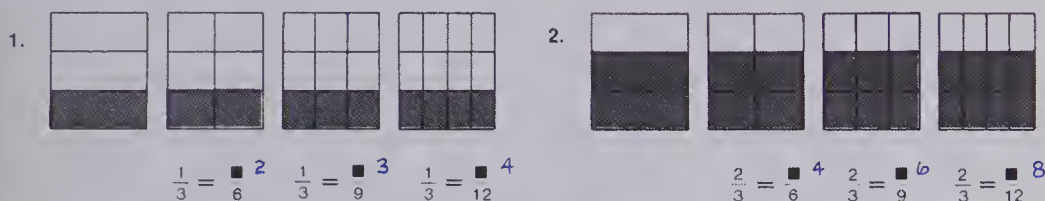
$$\frac{1}{2} = \frac{6}{12} \text{ in the 6 times column.}$$

$$\frac{1}{2} = \frac{10}{20} \text{ in the 10 times column.}$$

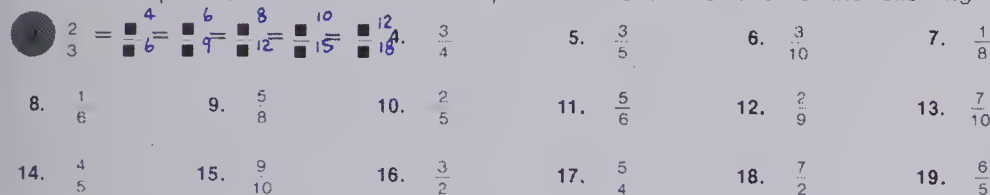
Both the numerator and denominator are multiplied by the same amount.

## Exercises

Use these diagrams to write equivalent fractions.

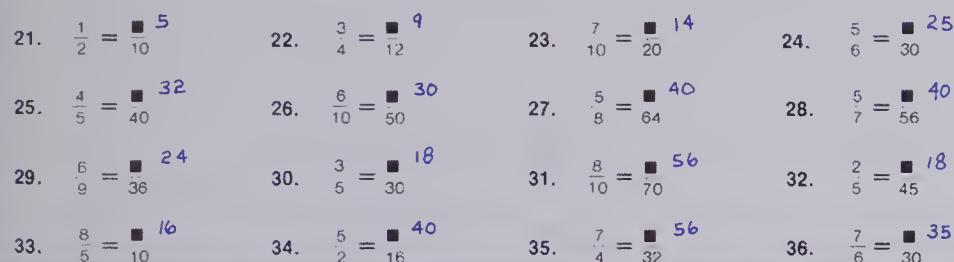


Use the multiplication chart to write five equivalent fractions for each of the following.



Exercises 16 to 19 are **improper fractions**. What is an improper fraction?  
A fraction where the numerator is greater than the denominator.

Use the multiplication chart to find these specific equivalent fractions.



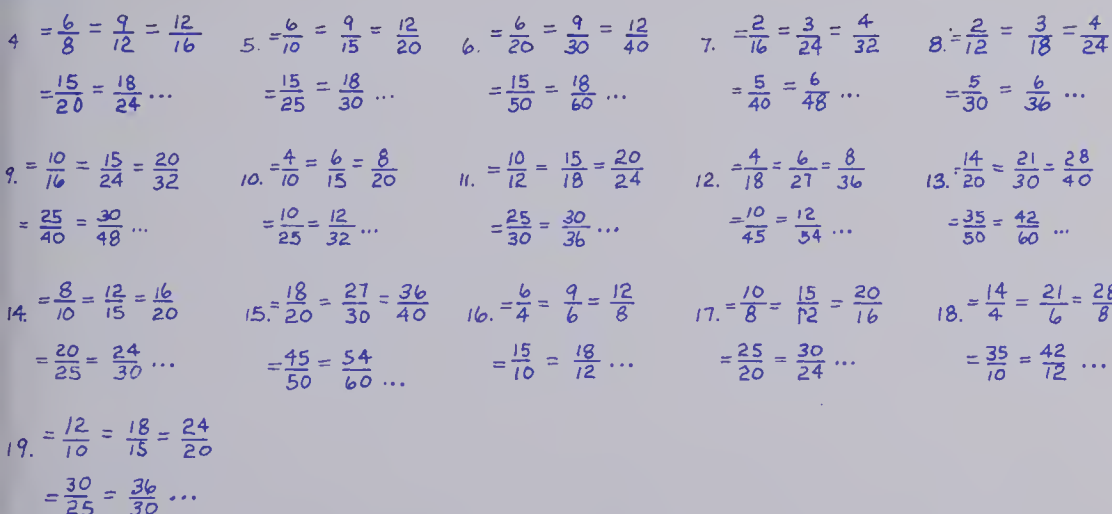
## BRAINTICKLER

How many different 3-digit numbers can you make using only the digits 2, 5, 7, and 8? You can use a digit only once in any number.

Example: 257, 258, 278, etc.

Equivalent fractions 239

ANSWERS:



Braintickler

275, 285, 287, 527, 528, 572, 582, 578, 587, 725, 752, 728, 782, 758, 785, 825, 852, 827, 872, 875, 857

## ACTIVITIES

1. Make a "Fraction Box" containing the following fractions printed on cards. Have the students help in the preparation of the cards.

$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \frac{1}{8}, \frac{1}{9}, \frac{1}{10}, \frac{2}{3}, \frac{2}{4}, \frac{2}{5},$   
 $\frac{2}{6}, \frac{2}{7}, \frac{2}{8}, \frac{2}{9}, \frac{2}{10}, \frac{3}{4}, \frac{3}{5}, \frac{3}{6}, \frac{3}{7}, \frac{3}{8}, \frac{3}{9}, \frac{3}{10},$   
 $\frac{4}{5}, \frac{4}{6}, \frac{4}{7}, \frac{4}{8}, \frac{4}{9}, \frac{4}{10}, \frac{5}{6}, \frac{5}{7}, \frac{5}{8}, \frac{5}{9}, \frac{5}{10},$   
 $\frac{6}{7}, \frac{6}{8}, \frac{6}{9}, \frac{6}{10}, \frac{7}{8}, \frac{7}{9}, \frac{7}{10}, \frac{8}{9}, \frac{8}{10}, \frac{9}{10}$

Students choose one fraction card from the box and list as many equivalent fractions as they can. Have them trade cards with a classmate and repeat. Correct the work using the multiplication chart.

$$\frac{2}{8} = \frac{4}{16} = \frac{6}{24} = \frac{8}{32} = \frac{10}{40} \dots$$

and some student will find  $\frac{2}{8} = \frac{1}{4}$  too!

2. Use the fractions in the "Fraction Box" as flash cards. Appoint a student as the leader for groups of six to eight students. The student leader chooses a fraction and shows the group. The group writes that fraction and one other equivalent fraction. The leader shows 5 fractions altogether and students then mark their work using the multiplication chart.

3. Play "Dominoes" as described in the Activity Reservoir.

## OBJECTIVE

To create equivalent fractions

## PACING

Level A All

Level B All

Level C All

## VOCABULARY

column

## MATERIALS

multiplication chart

## SUGGESTIONS

**Initial Activity** Using the multiplication chart show:

$\frac{1}{2} = \frac{2}{4}$  both the numerator and denominator are multiplied by 2.

$\frac{1}{2} = \frac{3}{6}$  both the numerator and denominator are multiplied by 3.

$\frac{1}{2} = \frac{4}{8}$  both the numerator and denominator are multiplied by 4, and so on.

Repeat the above for  $\frac{2}{3} = \frac{4}{6}$ .

$\frac{2}{3} = \frac{6}{9}, \dots, \frac{2}{3} = \frac{20}{30}$ .

## USING THE BOOK

Show  $\frac{2}{3} = \frac{2 \times 7}{3 \times 7} = \frac{14}{21}$ . Both can be multiplied by 7 because  $\frac{7}{7} = 1$  and any amount times 1 is equal to itself (identity element for multiplication).

Assign the exercises. Students may refer to the multiplication chart for assistance.

Encourage this format.

$$\frac{5}{6} = \frac{5 \times 7}{6 \times 7} = \frac{35}{42}$$

## ACTIVITIES

1. Have each student make up 4 questions like Exercises 13 to 16. Number them 17, 18, 19, and 20. Exchange and solve. Check the answers.

2. Using the fraction cards as described in the "Fraction Cards" idea in the Activity Reservoir and a die, make equivalent fractions.

(a) Draw a fraction card.

(b) Roll the die to determine the column.

(c) Calculate the equivalent fraction.

**Example**

Card is  $\frac{7}{8}$ . Die is 5.

Record  $\frac{7}{8} = \frac{7 \times 5}{8 \times 5} = \frac{35}{40}$

3. Have the students make up their own "fill-in-the-box" exercises of the sort shown in Exercises 5 to 16 on

## Equivalent Fractions

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6		10	12	14	16	18	20
3	3	6	9		15	18	21	24	27	30

From the chart we know:

$\frac{2}{3} = \frac{4}{6}$  in the 4 times column

and  $\frac{2}{3} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12}$

Both parts are in the same column so both parts of the fraction were multiplied by the same amount.

**Example**  $\frac{2}{3} = \frac{2}{21}, \frac{2}{3} = \frac{2 \times 7}{3 \times 7} = \frac{14}{21}$ . We multiply both parts by 7.

### Exercises

Copy and complete.

1.  $\frac{2}{3} = \frac{2 \times 5}{3 \times 5} = \frac{10}{15}$

2.  $\frac{3}{4} = \frac{3 \times 6}{4 \times 6} = \frac{18}{24}$

3.  $\frac{5}{8} = \frac{5 \times 2}{8 \times 2} = \frac{10}{16}$

4.  $\frac{2}{5} = \frac{2 \times 7}{5 \times 7} = \frac{14}{35}$

5.  $\frac{7}{10} = \frac{7 \times 5}{10 \times 5} = \frac{35}{50}$

6.  $\frac{3}{8} = \frac{3 \times 9}{8 \times 9} = \frac{27}{72}$

7.  $\frac{3}{10} = \frac{3 \times 18}{10 \times 18} = \frac{54}{180}$

8.  $\frac{4}{5} = \frac{4 \times 24}{5 \times 24} = \frac{96}{120}$

9.  $\frac{5}{6} = \frac{5 \times 35}{6 \times 35} = \frac{175}{210}$

10.  $\frac{1}{10} = \frac{1 \times 4}{10 \times 4} = \frac{4}{40}$

11.  $\frac{7}{8} = \frac{7 \times 35}{8 \times 35} = \frac{245}{280}$

12.  $\frac{3}{10} = \frac{3 \times 6}{10 \times 6} = \frac{18}{60}$

13.  $\frac{3}{5} = \frac{3 \times 12}{5 \times 12} = \frac{36}{60}$

14.  $\frac{3}{2} = \frac{3 \times 15}{2 \times 15} = \frac{45}{30}$

15.  $\frac{7}{4} = \frac{7 \times 28}{4 \times 28} = \frac{196}{112}$

16.  $\frac{5}{3} = \frac{5 \times 30}{3 \times 30} = \frac{150}{90}$

240 Calculating equivalent fractions

this page and exchange them with a classmate.



## Reduced Fractions

$\frac{8}{12}$  can be expressed as an equivalent fraction in **lowest terms**.

$$\frac{8}{12} = \frac{8-4}{12-4} = \frac{2}{3}$$

Both the numerator and denominator are divided by the same amount.

Reduce each to *lowest terms*:  $\frac{6}{15}$   $\frac{30}{40}$

$$\frac{6}{15} = \frac{6-3}{15-3} = \frac{2}{5}$$

and

$$\frac{30}{40} = \frac{30-10}{40-10} = \frac{3}{4}$$

### Exercises

Express these fractions in lowest terms.

$$\frac{2}{10} = \frac{2-2}{10-2} = \frac{1}{5}$$

$$\frac{3}{12} = \frac{3-3}{12-3} = \frac{1}{4}$$

- |                                    |                                  |                                   |                                   |
|------------------------------------|----------------------------------|-----------------------------------|-----------------------------------|
| 3. $\frac{4}{12} = \frac{1}{3}$    | 4. $\frac{5}{10} = \frac{1}{2}$  | 5. $\frac{3}{9} = \frac{1}{3}$    | 6. $\frac{5}{25} = \frac{1}{5}$   |
| 7. $\frac{4}{10} = \frac{2}{5}$    | 8. $\frac{9}{15} = \frac{3}{5}$  | 9. $\frac{8}{12} = \frac{2}{3}$   | 10. $\frac{9}{24} = \frac{3}{8}$  |
| 11. $\frac{10}{15} = \frac{2}{3}$  | 12. $\frac{8}{20} = \frac{2}{5}$ | 13. $\frac{21}{24} = \frac{7}{8}$ | 14. $\frac{15}{25} = \frac{3}{5}$ |
| 15. $\frac{14}{20} = \frac{7}{10}$ | 16. $\frac{3}{6} = \frac{1}{2}$  | 17. $\frac{40}{50} = \frac{4}{5}$ | 18. $\frac{32}{40} = \frac{4}{5}$ |

19. Write the following fractions on cards.

Write the equivalent fraction in lowest terms on the back of the cards.



20. Make up 5 equivalent fraction cards like those above.  
Use them as flashcards with a classmate.

Fractions in lowest terms 241

## OBJECTIVE

To express fractions in lowest terms

## PACING

Level A 1-18

Level B 1-20

Level C 1-20

## MATERIALS

multiplication chart

## RELATED AIDS

HMS — DM59.

## SUGGESTIONS

**Initial Activity** Review the use of the multiplication chart to find equivalent fractions as this has been presented over the last 3 pages. Complete several examples to stress (a) the movement from a "base fraction" (i.e.,  $\frac{1}{2}$ ,  $\frac{4}{5}$ ,  $\frac{7}{8}$ , etc.) located in the extreme left column of the chart to the various equivalent fractions (i.e.,  $\frac{3}{6}$ ,  $\frac{12}{15}$ ,  $\frac{49}{56}$ , etc.) located in the body of the chart; and (b) the fact that both the numerator and denominator are multiplied by the same amount.

Once this review is complete, use the chart to show the reverse process; that is, that fractions found in the body of the chart can be expressed in lowest terms by moving horizontally to the extreme left.

**Examples**

$$\frac{24}{40} = \frac{3}{5} \quad \frac{12}{42} = \frac{2}{7}$$

**Note:** Some do not create lowest terms fractions, e.g.,  $\frac{18}{72} = \frac{2}{8}$ .

$$\frac{2}{8} \text{ (will, in turn) } = \frac{1}{4}$$

## USING THE BOOK

Pose the question: "Why does  $\frac{4}{8} = \frac{1}{2}$ ?" Explain that since we found  $\frac{4}{8}$  in the "times 4" column and we move back to the "times 1" column for the answer, we are dividing by 4.

$$\text{Hence, } \frac{4 \div 4}{8 \div 4} = \frac{1}{2}$$

$$\text{Similarly, } \frac{24}{40} = \frac{24 \div 8}{40 \div 8} = \frac{3}{5}$$

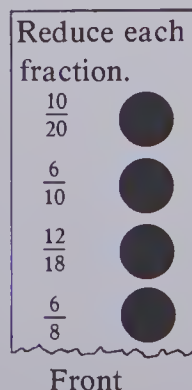
$$\text{and } \frac{12}{42} = \frac{12 \div 6}{42 \div 6} = \frac{2}{7}$$

Stress that the *amounts* expressed do not change because both the numerator and denominator are divided by the same amount.

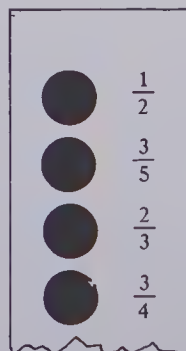
Assign the page. Record the work using the format in the display.

## ACTIVITIES

1. Make a deck of cards using the student's answers to Exercise 20. Encourage students to test each other. Improve accuracy first and speed later.
2. Prepare cards as shown. The circles represent holes punched with a single-hole punch. Students can, if necessary, poke a pencil tip through the card to reveal the correct answer on the back of the card.



Front



Back

3. See "Slalom" as described in the Activity Reservoir.

## OBJECTIVE

To check equivalent fractions using cross products

## PACING

Level A 1-11

Level B 1-14

Level C 1-14

## SUGGESTIONS

**Initial Activity** Have students refer to their corrected solutions to the exercises in equivalent fractions on page 240.

*Examples*

$$1. \frac{2}{3} = \frac{10}{15} \quad 2. \frac{3}{4} = \frac{18}{24}$$

Point out the interesting relationship which develops by cross multiplying.

$$2 \times 15 = 30 \quad 3 \times 24 = 72$$

$$3 \times 10 = 30 \quad 4 \times 18 = 72$$

Ask: "Does this pattern hold true for all the fractions we know are equivalent from this exercise?" Have groups of students check pairs of equivalent fractions.

You may wish to explain that one way to compare fractions is to change both so that they have the same denominator. Show that we can do this by multiplying both the numerator and denominator of one fraction by the denominator of the other.

*Example*

$$\frac{6}{8} \text{ and } \frac{3}{4}$$

$$\frac{6 \times 4}{8 \times 4} = \frac{24}{32} \text{ and } \frac{3 \times 8}{4 \times 8} = \frac{24}{32}$$

$$\text{Since } \frac{24}{32} = \frac{24}{32}, \frac{6}{8} = \frac{3}{4}.$$

*Example*

$$\frac{2}{3} \text{ and } \frac{3}{4}$$

$$\frac{2 \times 4}{3 \times 4} = \frac{8}{12} \text{ and } \frac{3 \times 3}{4 \times 3} = \frac{9}{12}$$

$$\text{Since } \frac{8}{12} < \frac{9}{12}, \frac{2}{3} < \frac{3}{4}.$$

Explain that using cross products (as presented on this page) is simply a short cut to the above process.

## USING THE BOOK

Read through the display at the top of the pupil page together, demonstrating that (as in the Initial Activity) cross products for equivalent fractions are equal and that for nonequivalent fractions, they are not equal.

Assign the exercises.

Be certain that the students are familiar with the accepted answer format.

## ACTIVITIES

1. Have the pupils help in the preparation of 25 pairs of equivalent fraction cards (i.e., 50 cards in the

## Checking Equivalent Fractions

$$\text{Is } \frac{6}{8} = \frac{3}{4} ?$$

$$8 \times 3 = 24$$

$$6 \times 4 = 24$$

$$\text{Yes — } \frac{6}{8} = \frac{3}{4}$$

$$\text{Is } \frac{4}{3} = \frac{3}{4} ?$$

$$3 \times 3 = 9$$

$$2 \times 4 = 8$$

$$\text{No — } \frac{4}{3} \neq \frac{3}{4}$$



### Exercises

Complete to check for equivalents

$$1. \frac{2}{8} \text{ and } \frac{3}{12}$$

$$8 \times 3 = 24$$

$$2 \times 12 = 24$$

Are  $\frac{2}{8}$  and  $\frac{3}{12}$  equivalent?

$$2. \frac{3}{5} \text{ and } \frac{6}{7}$$

$$5 \times 6 = 30$$

$$3 \times 7 = 21$$

Are  $\frac{3}{5}$  and  $\frac{6}{7}$  equivalent? No

Which pairs are equivalent fractions?

$$1. \frac{1}{2} \text{ and } \frac{3}{6} \rightarrow ? 6 \text{ No}$$

$$4. \frac{3}{9} \text{ and } \frac{2}{6} \rightarrow ? 18 \text{ Yes}$$

$$5. \frac{2}{10} \text{ and } \frac{3}{24} \rightarrow ? 24 \text{ No}$$

$$6. \frac{2}{10} \text{ and } \frac{3}{15} \rightarrow ? 30 \text{ Yes}$$

$$7. \frac{10}{15} \text{ and } \frac{3}{4} \rightarrow ? 40 \text{ No}$$

$$8. \frac{4}{12} \text{ and } \frac{6}{18} \rightarrow ? 36 \text{ Yes}$$

$$9. \frac{15}{24} \text{ and } \frac{3}{8} \rightarrow ? 24 \text{ No}$$

$$10. \frac{1}{3} \text{ and } \frac{33}{100} \rightarrow ? 300 \text{ No}$$

Write = or  $\neq$  for each

$$11. \frac{2}{7} \bullet \frac{7}{25} \neq$$

$$12. \frac{7}{8} \bullet \frac{18}{20} \neq$$

$$13. \frac{6}{8} \bullet \frac{9}{12} =$$

$$14. \frac{6}{15} \bullet \frac{10}{15} \neq$$

deck). Two to four players can use the cards to play "Equivalent Fraction Rummy".

The cards are shuffled and dealt (6 cards per player) face down in a pile on the table. The top card is turned over to start play. Players take turns drawing a card from the deck or from the discard pile and exchanging it with a card in their hand till someone uses the 6 cards in their hand to show three pairs of equivalent fractions. This player wins the round.

2. See "Fraction Snap" listed under the "Fraction Cards" ideas in the Activity Reservoir.

3. Play "Bingo" as described in the Activity Reservoir. Display a set of 25 fractions on the chalkboard from which players may select at random to fill their blank sheets. Have a student call out equivalent fractions to those 25 listed on the chalkboard. (The 25 pairs of cards from Activity 1 would be a good source.)

# Using Cross Products

We can use cross products to find equivalent fractions.  
We wish to solve for N

$$\begin{array}{c} \frac{3}{4} = \frac{N}{9} \\ \xrightarrow{\text{cross products}} \\ 3 \times N = 4 \times 9 \\ 3 \times N = 36 \\ N = 12 \end{array}$$

The equivalent fractions are  
 $\frac{3}{4} = \frac{9}{12}$

$$\begin{array}{c} \frac{2}{6} = \frac{N}{9} \\ \xrightarrow{\text{cross products}} \\ 6 \times N = 2 \times 9 \\ 6 \times N = 18 \\ N = 3 \end{array}$$

The equivalent fractions are  
 $\frac{2}{6} = \frac{3}{9}$

## Exercises

Complete to find equivalent fractions.

1.  $\frac{3}{4} = \frac{N}{6}$   $\xrightarrow{\text{cross products}}$   $\frac{3}{4} = \frac{N}{6}$   
 $\frac{3}{4} = \frac{N}{6}$   
 $\frac{3}{4} = \frac{N}{6}$   
 $N = 4.5$

Equivalent fractions are  
 $\frac{3}{4} = \frac{4.5}{6}$

2.  $\frac{3}{4} = \frac{N}{9}$   $\xrightarrow{\text{cross products}}$   $\frac{3}{4} = \frac{N}{9}$   
 $\frac{3}{4} = \frac{N}{9}$   
 $\frac{3}{4} = \frac{N}{9}$   
 $N = 6.75$

Equivalent fractions are  
 $\frac{3}{4} = \frac{6.75}{9}$

3.  $\frac{1}{2} = \frac{N}{4}$

4.  $\frac{1}{10} = \frac{N}{30}$

5.  $\frac{5}{6} = \frac{N}{12}$

6.  $\frac{1}{3} = \frac{N}{12}$

7.  $\frac{4}{4} = \frac{N}{3}$

8.  $\frac{1}{3} = \frac{N}{24}$

9.  $\frac{1}{2} = \frac{N}{21}$

10.  $\frac{4}{5} = \frac{N}{25}$

11.  $\frac{1}{10} = \frac{N}{10}$

12.  $\frac{4}{5} = \frac{N}{15}$

## BRAINTICKLER

Find a fraction equivalent to  $\frac{1}{4}$  and has a denominator 7 more than its numerator.

28/35



Using cross products 243

## OBJECTIVE

To determine equivalent fractions using cross products

## PACING

Level A 1-12

Level B 1-12 (Braintickler — optional)

Level C 1-12, Braintickler

## SUGGESTIONS

**Initial Activity** Review solutions to equations using *inspection*, e.g.,  $6 \times \blacksquare = 12$  means 6 times “what” equals 12? [ $6 \times \boxed{2} = 12$ ]

Repeat several examples using N instead of  $\blacksquare$ . Stress that N simply stands for some number.

## USING THE BOOK

Read through the display at the top of the pupil page together. Clarify what is happening from one line to the next in the “solution for N” process.

Complete Exercises 1 and 2 (and, if necessary, Exercise 3) orally, checking the process and each number that is substituted for each  $\blacksquare$ .

Assign the exercises and discuss the results.

## ACTIVITIES

1. If you have not already done so, see the Activities from the previous page.

2. The students might enjoy making up their own “N Mysteries” as shown in Exercises 3 to 12 for exchange with classmates.

3. Students might benefit from some practice activities related to multiplication facts. See the Activities listed on page 69 of the teaching notes.



## OBJECTIVE

To express improper fractions as mixed numerals

## PACING

Level A 1-16  
Level B 1-25  
Level C 1-26

## VOCABULARY

improper fractions, mixed numerals

## MATERIALS

cardboard pizza pies



4 in halves    2 in quarters    2 in thirds

## RELATED AIDS

BFA COMP LAB II — 72.

## SUGGESTIONS

**Initial Activity** Using the pizzas, show that  $\frac{2}{2} = 1$ ;  $\frac{3}{3} = 1$ ; and  $\frac{4}{4} = 1$ .

Select three pizza halves.

Show that  $\frac{3}{2} = 1\frac{1}{2}$  and  $\frac{1}{2}$   
or  $1\frac{1}{2}$

Show that  $\frac{4}{2} = 2$   
 $= 2$

$$\frac{5}{2} = 2\frac{1}{2}$$

$$\frac{6}{2} = 3 \quad \text{and} \quad \frac{7}{2} = 3\frac{1}{2}$$

## USING THE BOOK

Read through the information at the top of the pupil page. You may wish to display the definitions of "improper fractions" and "mixed numerals" (i.e., mixed numerals express an amount using a *mix* of whole numbers and fractions) somewhere in the classroom for future use. Demonstrate the three examples shown (i.e.,  $\frac{3}{2} = 1\frac{1}{2}$ ;  $\frac{5}{4} = 1\frac{1}{4}$ ;  $\frac{7}{2} = 3\frac{1}{2}$ ) using the pizza pieces used in the Initial Activity.

Before assigning the exercises, note that there are two different sets of instructions on this page. With this in mind, complete Exercises 1, 2, 15, 16, and, if necessary, 17 orally with the group.

## ACTIVITIES

1. Have pairs of students each write a number between 2 and 17 on paper.

## Mixed Numerals

Fractions like  $\frac{3}{2}$ ,  $\frac{5}{4}$ ,  $\frac{7}{2}$ , and  $\frac{6}{5}$  are called **improper fractions**.

The numerators are larger than the denominators.

These can be expressed as **mixed numerals**.

$$\frac{3}{2} = 1\frac{1}{2}$$

$$\frac{5}{4} = 1\frac{1}{4}$$

$$\frac{7}{2} = 3\frac{1}{2}$$

$1\frac{1}{2}$ ,  $1\frac{1}{4}$ , and  $3\frac{1}{2}$  are mixed numerals.

### Exercises

Express the following fractions as mixed numerals.

$$\frac{4}{3} = 1\frac{1}{3}$$

$$\frac{7}{4} = 1\frac{3}{4}$$

$$3. \frac{8}{5} = 1\frac{3}{5}$$

$$4. \frac{11}{6} = 1\frac{5}{6}$$

$$5. \frac{13}{10} = 1\frac{3}{10}$$

$$6. \frac{15}{8} = 1\frac{7}{8}$$

$$7. \frac{9}{5} = 1\frac{4}{5}$$

$$8. \frac{5}{3} = 1\frac{2}{3}$$

$$9. \frac{6}{5} = 1\frac{1}{5}$$

$$10. \frac{17}{12} = 1\frac{5}{12}$$

$$11. \frac{11}{8} = 1\frac{3}{8}$$

$$12. \frac{17}{10} = 1\frac{7}{10}$$

$$13. \frac{12}{5} = 2\frac{2}{5}$$

$$14. \frac{7}{2} = 3\frac{1}{2}$$

Reduce to lowest terms. Express as a mixed numeral.

The first one is done for you.

$$15. \frac{10}{4} = \frac{10 \div 2}{4 \div 2} = \frac{5}{2} = 2\frac{1}{2}$$

$$\frac{15}{6} = \frac{15 \div 3}{6 \div 3} = \frac{5}{2} = 2\frac{1}{2}$$

$$\frac{12}{8} = \frac{3}{2} = 1\frac{1}{2}$$

$$18. \frac{35}{10} = \frac{7}{2} = 3\frac{1}{2}$$

$$19. \frac{21}{9} = \frac{7}{3} = 2\frac{1}{3}$$

$$20. \frac{14}{8} = \frac{7}{4} = 1\frac{3}{4}$$

$$21. \frac{30}{12} = \frac{5}{2} = 2\frac{1}{2}$$

$$22. \frac{20}{12} = \frac{5}{3} = 1\frac{2}{3}$$

$$23. \frac{18}{4} = \frac{9}{2} = 4\frac{1}{2}$$

$$24. \frac{55}{15} = \frac{11}{3} = 3\frac{2}{3}$$

$$25. \frac{24}{16} = \frac{3}{2} = 1\frac{1}{2}$$

$$26. \frac{96}{30} = \frac{16}{5} = 3\frac{1}{5}$$

244 Mixed numerals

Use these numbers to create an improper fraction. Express each improper fraction as a mixed numeral.

**Example**

Ted writes 7.

Susie writes 12.

Improper fraction is  $\frac{12}{7}$ .

Both students calculate

$$\frac{12}{7} = \frac{7}{7} + \frac{5}{7} = 1\frac{5}{7}$$

Each pair should produce 6 improper fractions.

2. Have each pair of students record their 6 improper fractions on

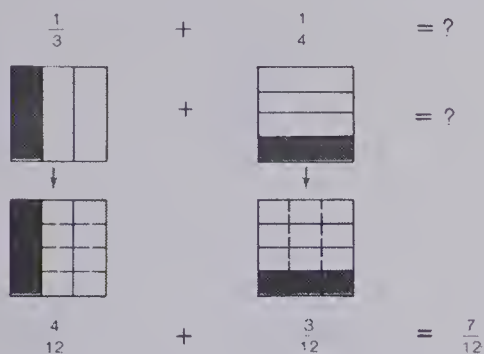
blank playing cards. The answers should be recorded on the back. Use these as cards for practising these skills.

3. Play "Concentration" as described in the Activity Reservoir. Have the students help prepare pairs of cards such as:

$$\frac{7}{4} \leftrightarrow 1\frac{3}{4} \quad \frac{12}{6} \leftrightarrow 2$$

$$\frac{15}{8} \leftrightarrow 1\frac{7}{8}$$

## Common Denominators



These fractions cannot be added in this form because the denominators are not the same.

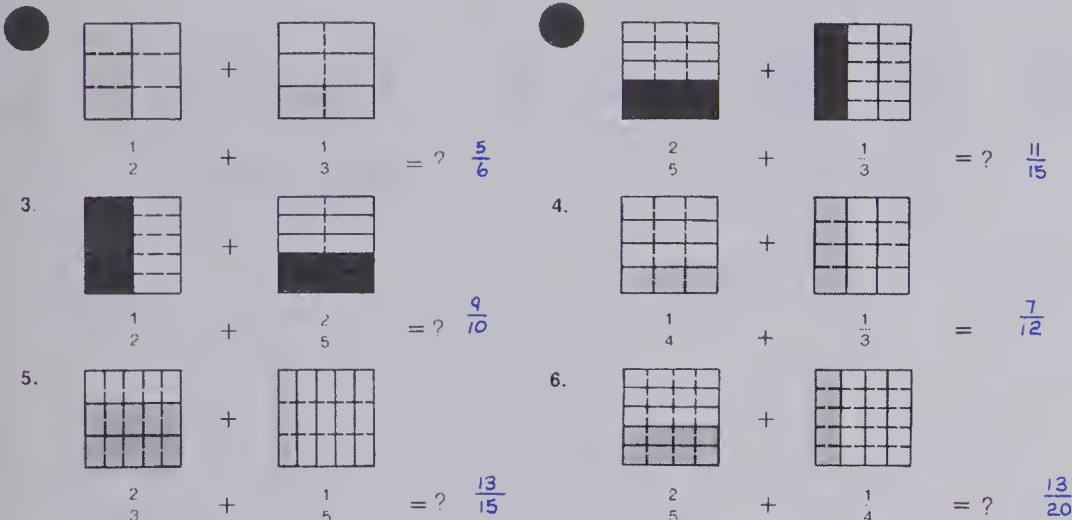
*Thirds and quarters can be changed to twelfths.*

The common denominator is twelve.

### Exercises

Find the common denominator. Draw a picture of the new parts.

Find the fraction for each ?



★ 7. How can you find the common denominator in each case (without a diagram)?

Common denominators 245

ANSWERS:

7. Find equivalent fractions.

## OBJECTIVE

To add fractions with unlike denominators

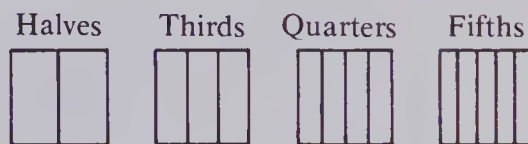
## PACING

Level A 1-6

Level B 1-6

Level C All

## MATERIALS



10 cm × 10 cm squares on acetate (2 of each), water-colour markers, overhead projector (see DM56)

## RELATED AIDS

HMS — DM56.

## SUGGESTIONS

**Initial Activity** Place a “thirds” acetate which has been coloured to show  $\frac{1}{3}$  on the overhead projector. Beside this (not on top of it) show a “fourths” acetate which shows  $\frac{1}{4}$  coloured. Ask: “How much is coloured altogether?” Point out that an accurate answer is not possible yet because we are attempting to add unequal units.

Overlay a *blank* “fourths” acetate on top of the original  $\frac{1}{3}$  to show  $\frac{4}{12}$ . Emphasize that the coloured amount has not changed, just the unit (from thirds to twelfths). Place a blank thirds acetate on top of the  $\frac{1}{4}$  transparency to now show  $\frac{3}{12}$ . Again, stress that the coloured amount hasn’t changed, just the unit (from fourths to twelfths). Again ask: “How much is coloured altogether?” Show that now the question can be answered,  $\frac{7}{12}$ , because we are using equal units (i.e., common denominators).

Repeat this process with some of the other transparencies (i.e.,  $\frac{1}{2} + \frac{2}{5}$ ,  $\frac{2}{3} + \frac{3}{5}$ , etc.).

## USING THE BOOK

Read through the display at the top of the pupil page together. Relate the similarity in the process here with the demonstrations shown in the Initial Activity.

Assign the exercises. Remind the pupils about the accepted answer format in your class.

## ACTIVITIES

1. Allow pupils to use the transparencies discussed in the Materials section. Have them choose two at random and identify the common denominator. You may wish to add “sixths” and “tenths” transparencies to the set.

2. As an aid to later computations, provide some oral (and/or written) drill with regard to multiplication and division facts.

3. See “Quad-Row” as described in the Activity Reservoir.

## EXTRA PRACTICE

Using 10 cm square grids, draw the following.

(a)  $\frac{1}{5} + \frac{1}{3} = ?$  (b)  $\frac{3}{5} + \frac{1}{6} = ?$

(c)  $\frac{1}{5} + \frac{3}{4} = ?$  (d)  $\frac{2}{3} + \frac{3}{4} = ?$

(i) Show common denominators.

(ii) Add the equal-sized parts to get the answer.

## OBJECTIVE

To add fractions having unlike denominators

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

Halves Thirds Quarters Fifths Tenths



2 each on 10 cm × 10 cm acetate

## RELATED AIDS

HMS — DM56.  
BFA COMP LAB II — 69.

## SUGGESTIONS

**Initial Activity** Review equivalent fractions using examples such as:  
 $\frac{2}{3} = \frac{4}{6}$ ,  $\frac{3}{4} = \frac{6}{8}$ ,  $\frac{1}{2} = \frac{5}{10}$ .

Use a method similar to that described on page 245 to show, using acetates, that the common denominator for halves and fifths is tenths.

$$\frac{1}{2} = \frac{5}{10} \quad \frac{1}{5} = \frac{2}{10} \quad \frac{5}{10} + \frac{2}{10} = \frac{7}{10}$$

Repeat for thirds and fourths; fourths and fifths; halves and tenths; and so on.

## USING THE BOOK

Illustrate and discuss how Exercise 1 is done using the 10 cm acetate squares. Clarify that both the numerator and denominator are multiplied by the same amount.

In all of the exercises on page 246, the common denominator is the product of the two denominators. Exercise 9 could be done two ways.

$$\begin{array}{r} \frac{1}{10} = \frac{1}{10} \\ + \frac{1}{2} = +\frac{5}{10} \\ \hline \frac{6}{10} \text{ or } \frac{3}{5} \end{array}$$

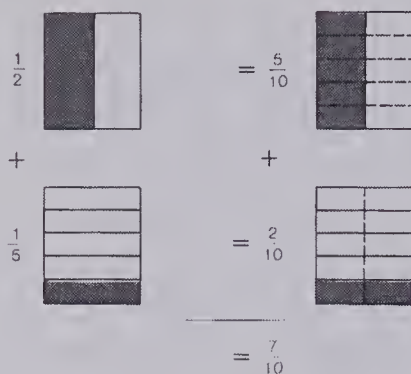
or

$$\begin{array}{r} \frac{1}{10} = \frac{2}{20} \\ + \frac{1}{2} = +\frac{10}{20} \\ \hline \frac{12}{20} \text{ or } \frac{6}{10} \text{ or } \frac{3}{5} \end{array}$$

Remind students to include fractional answers in lowest terms.

Read through the information at the top of the pupil page. Relate its

## Adding with Common Denominators



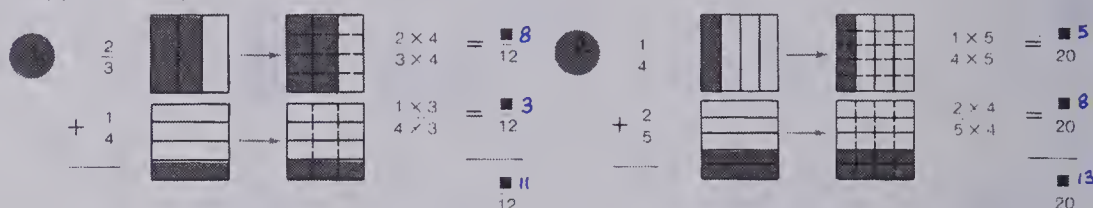
$$\begin{array}{r} \frac{1 \times 5}{2 \times 5} = \frac{5}{10} \\ + \frac{1 \times 2}{5 \times 2} = \frac{2}{10} \\ \hline \frac{7}{10} \end{array}$$

The common denominator is 10 because the product of the denominators is 10.

$$2 \times 5 = 10$$

### Exercises

Copy and complete.



Add using common denominators.

3. $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$	4. $\frac{2}{5} + \frac{1}{3} = \frac{11}{15}$	5. $\frac{1}{8} + \frac{3}{8} = \frac{4}{8} = \frac{1}{2}$	6. $\frac{1}{3} + \frac{2}{7} = \frac{13}{21}$	7. $\frac{3}{10} + \frac{1}{5} = \frac{5}{10} = \frac{1}{2}$
8. $\frac{3}{8} + \frac{1}{3} = \frac{17}{24}$	9. $\frac{1}{10} + \frac{1}{2} = \frac{6}{10} \text{ or } \frac{3}{5}$	10. $\frac{2}{9} + \frac{1}{2} = \frac{13}{18}$	11. $\frac{1}{6} + \frac{4}{5} = \frac{29}{30}$	12. $\frac{4}{9} + \frac{1}{4} = \frac{25}{36}$

246 Addition of unlike fractions

similarity to the demonstration shown during the Initial Activity. Stress the information that is printed in the box.

## ACTIVITIES

1. Challenge the students with the following. Add these unit fraction neighbours. A unit fraction has a numerator of 1. Can you discover a pattern for the answers based on the denominators? [In all answers, the denominators are the product and the numerators are the sum of the original denominators.]

- $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
- $\frac{1}{3} + \frac{1}{4} = \frac{7}{12}$
- $\frac{1}{4} + \frac{1}{5} = \frac{9}{20}$
- $\frac{1}{5} + \frac{1}{6} = \frac{11}{30}$
- $\frac{1}{6} + \frac{1}{7} = \frac{13}{42}$

Predict the answers to these. Check

your predictions afterwards.

- $\frac{1}{7} + \frac{1}{8} = \frac{15}{56}$
- $\frac{1}{8} + \frac{1}{9} = \frac{17}{72}$
- $\frac{1}{9} + \frac{1}{10} = \frac{19}{90}$

2. Have the students predict the answers for these unit fraction sums. Check their predictions.

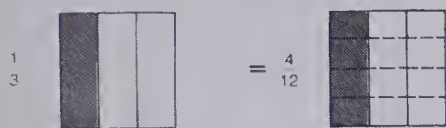
$$\left[ \text{Answers} = \frac{\text{sum of denominators}}{\text{product of denominators}} \right]$$

- $\frac{1}{2} + \frac{1}{5} = \frac{7}{10}$
- $\frac{1}{4} + \frac{1}{6} = \frac{5}{12}$
- $\frac{1}{3} + \frac{1}{5} = \frac{8}{15}$
- $\frac{1}{5} + \frac{1}{8} = \frac{13}{40}$
- $\frac{1}{3} + \frac{1}{7} = \frac{10}{21}$
- $\frac{1}{5} + \frac{1}{10} = \frac{3}{10}$

3. Have the students make up their own "Unit Fraction Sums". Have them written on cards for later use or for exchange with other groups or classmates.



## Subtracting with Common Denominators



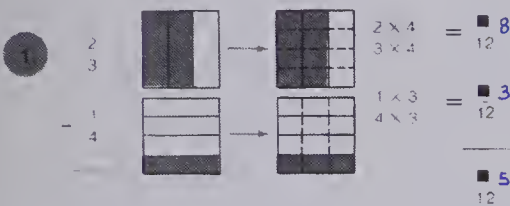
$$\begin{array}{r} 1 \times 4 = 4 \\ 3 \times 4 = 12 \\ - 1 \times 3 = 3 \\ 4 \times 3 = 12 \\ \hline 1 \\ 12 \end{array}$$

The common denominator is 12, because the product of the denominators is 12.

$$3 \times 4 = 12$$

### Exercises

Copy and complete.



Subtract using common denominators.

3. $\frac{1}{2} - \frac{1}{3} = \frac{1}{6}$	4. $\frac{4}{5} - \frac{2}{3} = \frac{2}{15}$	5. $\frac{5}{8} - \frac{2}{5} = \frac{9}{40}$	6. $\frac{2}{3} - \frac{1}{7} = \frac{11}{21}$	7. $\frac{7}{10} - \frac{2}{3} = \frac{1}{30}$
--	---	---	--	--

Write in a vertical format and subtract.

8. $\frac{7}{8} - \frac{1}{3} = \frac{13}{24}$	9. $\frac{9}{10} - \frac{1}{2} = \frac{4}{10}$	10. $\frac{8}{9} - \frac{1}{2} = \frac{7}{18}$	11. $\frac{5}{6} - \frac{2}{5} = \frac{13}{30}$
12. $\frac{4}{9} - \frac{1}{4} = \frac{7}{36}$	13. $\frac{1}{5} - \frac{1}{8} = \frac{3}{40}$	14. $\frac{1}{3} - \frac{1}{10} = \frac{7}{30}$	15. $\frac{1}{4} - \frac{1}{5} = \frac{1}{20}$

Subtraction of unlike fractions 247

## OBJECTIVE

To subtract fractions with unlike denominators

## PACING

Level A 1-11  
Level B 1-15  
Level C 1-15

## RELATED AIDS

HMS — DM56.  
BFA COMP LAB II — 70.

## MATERIALS

Halves Thirds Quarters Fifths Tenths



2 each on 10 cm × 10 cm acetate

## SUGGESTIONS

**Initial Activity** Use a method similar to that discussed in the Initial Activities of the last two pages to show subtraction of fractions with unlike denominators. You may wish to complete several examples similar to that shown in the display at the top of the pupil page.

## USING THE BOOK

Read through the display at the top of the pupil page together. Point out the similarity of process between what is discussed here and what was shown on page 246, the only exception being the subtraction operation.

Discuss Exercise 1 using the overhead projector and acetates. Exercise 9 could be done using the common denominator twentieths or tenths.

$$\begin{array}{r} \frac{9}{10} = \frac{18}{20} \\ - \frac{1}{2} = - \frac{10}{20} \\ \hline \frac{8}{20} \text{ or } \frac{4}{10} \text{ or } \frac{2}{5} \end{array}$$

or

$$\begin{array}{r} \frac{9}{10} = \frac{9}{10} \\ - \frac{1}{2} = - \frac{5}{10} \\ \hline \frac{4}{10} \text{ or } \frac{2}{5} \end{array}$$

Both methods are acceptable. Remind students to include fractional answers in lowest terms. Assign the exercises.

For the instructions for Exercises 8 to 15, you may wish to clarify what is meant by "vertical format".

## ACTIVITIES

1. Prepare challenges for the students such as these. Subtract the following unit fraction neighbours. Can you see a pattern to these answers? [Answers are always  $\frac{1}{\text{product of denominators}}$ .]

(a)  $\frac{1}{2} - \frac{1}{3} = \frac{1}{6}$  (b)  $\frac{1}{3} - \frac{1}{4} = \frac{1}{12}$

(c)  $\frac{1}{4} - \frac{1}{5} = \frac{1}{20}$  (d)  $\frac{1}{5} - \frac{1}{6} = \frac{1}{30}$

Predict the answers to these. Check your predictions afterwards.

(e)  $\frac{1}{6} - \frac{1}{7} = \frac{1}{42}$  (f)  $\frac{1}{8} - \frac{1}{9} = \frac{1}{72}$

(g)  $\frac{1}{7} - \frac{1}{8} = \frac{1}{56}$  (h)  $\frac{1}{9} - \frac{1}{10} = \frac{1}{90}$

2. Subtract the following pairs of unit fractions. Predict answers when you see a pattern. Check your predictions.

[Pattern:  $\frac{\text{difference between denominators}}{\text{product of denominators}}$ ]

(a)  $\frac{1}{2} - \frac{1}{6} = \frac{1}{3}$  (b)  $\frac{1}{3} - \frac{1}{5} = \frac{2}{15}$

(c)  $\frac{1}{2} - \frac{1}{5} = \frac{3}{10}$  (d)  $\frac{1}{3} - \frac{1}{7} = \frac{4}{21}$

(e)  $\frac{1}{2} - \frac{1}{7} = \frac{5}{14}$  (f)  $\frac{1}{3} - \frac{1}{10} = \frac{7}{30}$

(g)  $\frac{1}{2} - \frac{1}{9} = \frac{7}{18}$  (h)  $\frac{1}{4} - \frac{1}{7} = \frac{3}{28}$

(i)  $\frac{1}{2} - \frac{1}{10} = \frac{4}{10} = \frac{2}{5}$  (j)  $\frac{1}{4} - \frac{1}{9} = \frac{5}{36}$

3. The students might enjoy preparing their own "Unit Fraction Challenges" for exchange with classmates. Have them mix up their challenges with addition questions.

## OBJECTIVE

To add and subtract unlike fractions

## PACING

Level A 1-15

Level B 1-16

Level C 1-18

## MATERIALS

Halves Thirds Quarters Fifths Tenths



2 each on 10 cm × 10 cm acetate

## RELATED AIDS

HMS — DM56.

## BACKGROUND

This page is a review assignment for practice of skills from pages 244 to 247.

## SUGGESTIONS

**Initial Activity** Review the finding of common denominators and the creation of equivalent fractions using the acetate transparencies.

*Examples*

$$\frac{3}{4} = \frac{?}{20} \longrightarrow \frac{3 \times 5}{4 \times 5} = \frac{15}{20}$$

$$\frac{2}{5} = \frac{?}{20} \longrightarrow \frac{2 \times 4}{5 \times 4} = \frac{8}{20}$$

## USING THE BOOK

Show addition and subtraction as in the pupil display.

Assign Exercises 1 to 3. Have students check their answers before proceeding. Remind students to be careful to perform the correct operation.

*Note:* Exercises 7 and 13; common denominator could be 40 or 20.

Exercise 8; common denominator could be 20 or 10.

Use these questions as examples again after page 249 is done.

## ACTIVITIES

Have the students copy this "Factor Tower" in their workbooks. Write the instructions listed below on the chalkboard.

### Adding and Subtracting Fractions

**Add.**

$$\frac{3}{4} = \frac{15}{20}$$

$$+ \frac{2}{5} = \frac{8}{20}$$


---


$$\frac{23}{20} \text{ or } 1 \frac{3}{20}$$

*Think:*

$$\frac{3}{4} = \frac{3 \times 5}{4 \times 5} = \frac{15}{20}$$

$$\frac{2}{5} = \frac{2 \times 4}{5 \times 4} = \frac{8}{20}$$

**Subtract.**

$$\frac{3}{4} = \frac{15}{20}$$

$$- \frac{2}{5} = \frac{8}{20}$$


---


$$\frac{7}{20}$$

Sometimes the answer is greater than 1.

#### Exercises

Perform the indicated operations.

1.  $\frac{1}{4} = \frac{5}{20}$

$+ \frac{3}{5} = \frac{12}{20}$

---

$\frac{17}{20}$

2.  $\frac{1}{10} = \frac{3}{30}$

$+ \frac{2}{3} = \frac{20}{30}$

---

$\frac{23}{30}$

3.  $\frac{7}{8} = \frac{21}{24}$

$- \frac{2}{3} = \frac{16}{24}$

---

$\frac{5}{24}$

4.  $\frac{3}{4} - \frac{2}{5} = \frac{7}{20}$

5.  $\frac{5}{8} + \frac{4}{5} = \frac{57}{40} \text{ or } 1 \frac{17}{40}$

6.  $\frac{7}{10} + \frac{4}{3} = \frac{41}{30} \text{ or } 1 \frac{11}{30}$

7.  $\frac{9}{10} - \frac{3}{4} = \frac{3}{20}$

8.  $\frac{3}{10} + \frac{1}{2} = \frac{8}{10} \text{ or } \frac{4}{5}$

9.  $\frac{7}{8} - \frac{1}{3} = \frac{13}{24}$

10.  $\frac{3}{5} + \frac{5}{6} = \frac{43}{30} \text{ or } 1 \frac{13}{30}$

11.  $\frac{7}{8} - \frac{3}{5} = \frac{11}{40}$

12.  $\frac{3}{4} + \frac{2}{5} = \frac{23}{20} \text{ or } 1 \frac{3}{20}$

13.  $\frac{3}{10} - \frac{1}{4} = \frac{1}{20}$

14.  $\frac{4}{5} - \frac{2}{3} = \frac{2}{15}$

15.  $\frac{7}{8} + \frac{2}{3} = \frac{37}{24} \text{ or } 1 \frac{13}{24}$

16.  $\frac{7}{5} - \frac{4}{3} = \frac{1}{15}$

17.  $\frac{9}{8} + \frac{5}{3} = \frac{67}{24} \text{ or } 2 \frac{19}{24}$

18.  $\frac{12}{5} - \frac{7}{6} = \frac{37}{30} \text{ or } 1 \frac{7}{30}$

248 Addition and subtraction

Halves

Thirds

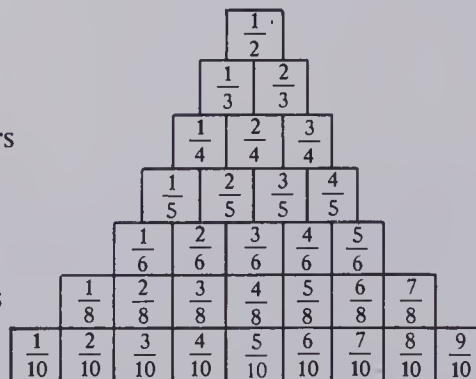
Quarters

Fifths

Sixths

Eighths

Tenths



1. In your notebook:

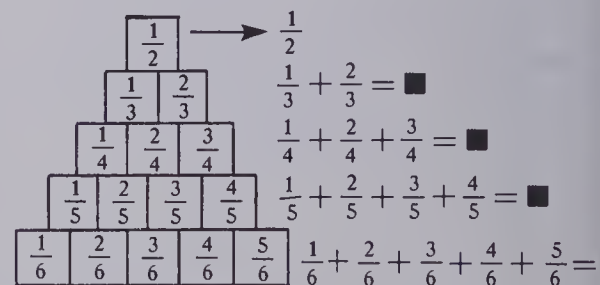
- Colour all fractions equivalent to  $\frac{1}{2}$  blue.
- Colour all fractions equivalent to  $\frac{1}{3}$  red.
- Colour all fractions equivalent to  $\frac{2}{3}$  purple.
- Colour all fractions equivalent to  $\frac{1}{4}$  yellow.

(e) Colour all fractions equivalent to  $\frac{3}{4}$  green.

(f) Colour any other pairs of equivalent fractions the same colour. (You choose the colours.)

2. Using different coloured pairs of fractions from different levels of the tower make up 10 addition questions. Use each fraction only once. Solve each of your 10 questions.

3. Find the sum of each row of fractions in this mini-tower.



Do you see any patterns in the answers?

## Least Common Denominators

Sometimes the common denominator is the larger denominator or a multiple of the larger denominator.

$$\begin{array}{r} \frac{3}{5} = \frac{6}{10} \\ + \frac{7}{10} = \frac{7}{10} \\ \hline \frac{13}{10} \text{ or } 1\frac{3}{10} \end{array}$$

$$\frac{13}{10} \text{ or } 1\frac{3}{10}$$

10 is a multiple of 5.  
10 is the **least**  
**common denominator.**

$$\begin{array}{r} \frac{3}{10} = \frac{6}{20} \\ + \frac{1}{4} = \frac{5}{20} \\ \hline \frac{11}{20} \end{array}$$

$$\frac{11}{20}$$

20 is a multiple of 10.  
20 is also a multiple of 4.  
20 is the **least**  
**common denominator.**

$$\begin{array}{r} \frac{7}{10} = \frac{28}{40} \\ - \frac{1}{8} = \frac{5}{40} \\ \hline \frac{23}{40} \end{array}$$

$$\frac{23}{40}$$

40 is a multiple of 10.  
40 is also a multiple of 8.  
40 is the **least**  
**common denominator.**

### Exercises

Add or subtract using the least common denominators.

$$\begin{array}{r} \frac{1}{2} = \frac{5}{10} \\ + \frac{3}{10} = \frac{3}{10} \\ \hline \frac{8}{10} \text{ or } \frac{4}{5} \end{array}$$

$$\frac{8}{10} \text{ or } \frac{4}{5}$$

$$\begin{array}{r} \frac{3}{4} = \frac{21}{24} \\ + \frac{1}{8} = \frac{3}{24} \\ \hline \frac{24}{24} \text{ or } 1 \end{array}$$

$$\frac{21}{24} \text{ or } \frac{7}{8}$$

$$\begin{array}{r} \frac{3}{4} = \frac{15}{20} \\ + \frac{9}{10} = \frac{18}{20} \\ \hline \frac{33}{20} = 1\frac{13}{20} \end{array}$$

$$\frac{33}{20} = 1\frac{13}{20}$$

$$\begin{array}{r} \frac{1}{2} = \frac{4}{6} \\ + \frac{1}{6} = \frac{2}{6} \\ \hline \frac{5}{6} \end{array}$$

$$\frac{4}{6} \text{ or } \frac{2}{3}$$

$$\begin{array}{r} \frac{3}{4} = \frac{21}{24} \\ + \frac{1}{8} = \frac{3}{24} \\ \hline \frac{24}{24} \text{ or } 1 \end{array}$$

$$\frac{21}{24} \text{ or } \frac{7}{8}$$

$$\begin{array}{r} \frac{3}{4} = \frac{15}{20} \\ + \frac{9}{10} = \frac{18}{20} \\ \hline \frac{33}{20} = 1\frac{13}{20} \end{array}$$

$$\frac{33}{20} = 1\frac{13}{20}$$

$$\begin{array}{r} \frac{1}{2} = \frac{4}{6} \\ + \frac{1}{6} = \frac{2}{6} \\ \hline \frac{5}{6} \end{array}$$

$$\frac{4}{6} \text{ or } \frac{2}{3}$$

$$\begin{array}{r} \frac{4}{5} = \frac{19}{15} \\ + \frac{1}{15} = \frac{1}{15} \\ \hline \frac{20}{15} \text{ or } \frac{4}{3} \end{array}$$

$$\frac{19}{15} \text{ or } \frac{4}{3}$$

$$\begin{array}{r} \frac{7}{10} = \frac{2}{10} \\ - \frac{1}{2} = \frac{5}{10} \\ \hline \frac{1}{10} \end{array}$$

$$\frac{2}{10} \text{ or } \frac{1}{5}$$

$$\begin{array}{r} \frac{5}{6} = \frac{7}{12} \\ - \frac{1}{4} = \frac{3}{12} \\ \hline \frac{4}{12} \text{ or } \frac{1}{3} \end{array}$$

$$\frac{7}{12}$$

$$\begin{array}{r} \frac{9}{10} = \frac{2}{30} \\ - \frac{5}{6} = \frac{5}{15} \\ \hline \frac{2}{30} \text{ or } \frac{1}{15} \end{array}$$

$$\frac{2}{30} \text{ or } \frac{1}{15}$$

$$\begin{array}{r} \frac{5}{6} = \frac{1}{12} \\ - \frac{3}{4} = \frac{9}{12} \\ \hline \frac{1}{12} \end{array}$$

$$\frac{1}{12}$$

$$\begin{array}{r} \frac{7}{8} = \frac{11}{24} \\ - \frac{5}{12} = \frac{10}{24} \\ \hline \frac{1}{24} \end{array}$$

$$\frac{11}{24}$$

## OBJECTIVE

To determine the least common denominator

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

multiples, least common denominator

## MATERIALS



10 cm × 10 cm acetate squares as shown

## RELATED AIDS

HMS — DM56 and DM60.

## BACKGROUND

Up until this point in the text, the student has used the product of the denominators as the common denominator. This method will always work, but it could produce some unwieldy numbers.

You may wish to complete Exercises 1, 2, 9, and 10 orally before assigning the rest. Remind the students to use the multiples lists, if necessary, to help them determine least common denominators.

## ACTIVITIES

1. "LCD Snap" Using fraction cards, give each of two players an equal number of cards. Place each pile face down in front of the players. Each player turns a card. The first player to state the least common denominator for both fractions wins both cards. If incorrect, the other player wins. The winner is the person with the most cards after 10 min.

2. Have the students write the first 20 multiples of 2, 3, 4, and 5 and the first 10 multiples 6, 7, 8, 9, 10, 12, and 15. Have them use these lists of multiples to determine the least common denominator for any of the following pairs of denominators.

- (a) eighths and twelfths
- (b) fifths and fifteenths
- (c) sixths and tenths

3. If you have not already done so, see the "Fraction Cards" ideas as described in the Activity Reservoir.

## SUGGESTIONS

**Initial Activity** Review the meaning of multiples. List these together with the class.

- (a) multiples of 10 [10, 20, 30, 40, ...]
- (b) multiples of 6
- (c) multiples of 4
- (d) multiples of 8
- (e) multiples of 12
- (f) multiples of 15

List these on the chalkboard for later use.

Using the acetates from the Materials section, show how the common denominator of fifths and tenths can be "fiftieths".



But it could be tenths because each  $\frac{2}{10}$  interval coincides with a  $\frac{1}{5}$  and all 10 parts are equal. Thus, the least common denominator is tenths.

$$\begin{array}{r} \frac{3}{5} = \frac{6}{10} \\ + \frac{7}{10} = \frac{7}{10} \\ \hline \frac{13}{10} \text{ or } 1\frac{3}{10} \end{array}$$

Show how tenths and quarters in this

format  made twentieths.

$$\begin{array}{r} \text{Thus } \frac{3}{10} = \frac{6}{20} \\ + \frac{1}{4} = \frac{5}{20} \\ \hline \frac{11}{20} \end{array}$$

## USING THE BOOK

Discuss the three examples shown at the top of the pupil page. Using the "multiples lists" compiled in the Initial Activity, show in the 3rd example that: The second multiple of 10 is 20. 20 is not a multiple of 8. The third multiple of 10 is 30. 30 is not a multiple of 8. The fourth multiple of 10 is 40. 40 is a multiple of 8.

$$\begin{array}{r} \text{Thus } \frac{7}{10} = \frac{28}{40} \leftarrow \frac{7 \times 4}{10 \times 4} = \frac{28}{40} \\ - \frac{1}{8} = \frac{5}{40} \leftarrow \frac{1 \times 5}{8 \times 5} = \frac{5}{40} \\ \hline \frac{23}{40} \end{array}$$



## OBJECTIVE

To add and subtract mixed numerals

## PACING

Level A None

Level B 1-3, 6-10, 13-15

Level C 1, 2, 4, 6-8, 11-20

## RELATED AIDS

HMS — DM61.

BFA COMP LAB II — 71-73.

## BACKGROUND

It is assumed that the students by now can add and subtract whole numbers and fractions. This is all that is required to add and subtract mixed numerals.

## SUGGESTIONS

**Initial Activity** Discuss an addition problem of the sort shown in the display at the top of the pupil page.

(a)  $4\frac{3}{4}$  can be thought of as four and three quarters.

$$4 + \frac{3}{4}$$

(b)  $7\frac{1}{4}$  can be thought of as seven and one quarter.

$$+ 7 + \frac{1}{4}$$

(c) Add whole numbers.

(d) Add fractional parts.

$$11 + \frac{4}{4} = \boxed{11\frac{4}{4}}$$

(e) Write as a mixed numeral or whole number.

$$\text{or } \boxed{12}$$

If necessary, repeat using mixed numerals which have fractional parts with like denominators (e.g.,  $6\frac{1}{3} + 5\frac{1}{3}$ ,  $3\frac{1}{7} + 12\frac{1}{7}$ ) to reinforce the process of "add whole numbers first; add fractional parts; reassemble the whole number and fraction sums to yield the answer".

Present an addition problem with mixed numerals such as  $3\frac{1}{3} + 2\frac{1}{2}$ . Introduce the new step required (i.e., to find common denominators for the fraction parts) so that the overall process now becomes: (a)  $3\frac{1}{3}$  can be thought of as  $3 + \frac{1}{3}$ ; (b)  $2\frac{1}{2}$  can be thought of as  $2 + \frac{1}{2}$ ; (c) add whole numbers; (d) change fractional parts to equivalent fractions with like denominators,  $\frac{1}{3} + \frac{1}{2} \rightarrow \frac{2}{6} + \frac{3}{6}$ ; (e) add fractional parts; (f) write the answer as a mixed numeral or whole number.

## The Variety Store

Darin had a part-time job in a variety store.

He worked  $4\frac{3}{4}$  h on Friday evening and  $7\frac{1}{4}$  h on Saturday

How many hours did he work?

$$4\frac{3}{4} = 4 + \frac{3}{4}$$

$$+ 7\frac{1}{4} = 7 + \frac{1}{4}$$

$$11 + \frac{4}{4} = \boxed{11\frac{4}{4}} \text{ or } \boxed{12} \quad \text{Darin worked 12 h.}$$

Find the common denominator and add.

$$3\frac{1}{4} = 3 + \frac{3}{12}$$

$$+ 2\frac{1}{3} = 2 + \frac{4}{12}$$

$$5 + \frac{7}{12} = \boxed{5\frac{7}{12}}$$



$$2\frac{1}{10} = 2 + \frac{1}{10}$$

$$+ 6\frac{3}{5} = 6 + \frac{6}{10}$$

$$8 + \frac{7}{10} = \boxed{8\frac{7}{10}}$$

### Exercises

Add.

$$3\frac{2}{5} = 3 + \frac{2}{5}$$

$$+ 4\frac{1}{5} = 4 + \frac{1}{5}$$

$$7\frac{3}{5} = 7 + \frac{3}{5}$$

$$2\frac{1}{10} = 2 + \frac{1}{10}$$

$$+ 5\frac{7}{10} = 5 + \frac{7}{10}$$

$$7\frac{8}{10} = 7 + \frac{8}{10}$$

$$3. 5\frac{3}{8} + 2\frac{1}{8} = 7\frac{4}{8} = 7\frac{1}{2}$$

$$4. 6\frac{1}{6} + 1\frac{2}{6} = 7\frac{3}{6} = 7\frac{1}{2}$$

$$5. 4\frac{3}{10} + 2\frac{1}{10} = 6\frac{4}{10} = 6\frac{2}{5}$$

$$6. 8\frac{5}{12} + 6\frac{2}{12} = 14\frac{7}{12}$$

Find the common denominators and add

$$1\frac{2}{5} = 1 + \frac{8}{20}$$

$$+ 7\frac{1}{4} = 7 + \frac{5}{20}$$

$$8\frac{13}{20} = 8 + \frac{13}{20}$$

$$8\frac{1}{6} = 8 + \frac{1}{6}$$

$$+ 1\frac{2}{3} = 1 + \frac{4}{6}$$

$$9\frac{5}{6} = 9 + \frac{5}{6}$$

$$9. 4\frac{3}{4} + 2\frac{1}{4} = 6\frac{4}{4} = 7$$

$$10. 1\frac{1}{3} + 3\frac{2}{3} = 4\frac{3}{3} = 5$$

$$11. 3\frac{1}{2} + 4\frac{3}{10} = 7\frac{8}{10} = 7\frac{4}{5}$$

$$12. 4\frac{1}{3} + 2\frac{7}{12} = 6\frac{11}{12}$$

Subtract.

$$13. 7\frac{3}{4} - 5\frac{1}{4} = 2\frac{2}{4} = 2\frac{1}{2}$$

$$14. 3\frac{5}{6} - 2\frac{3}{6} = 1\frac{2}{6} = 1\frac{1}{3}$$

$$15. 3\frac{9}{10} - 1\frac{4}{10} = 2\frac{5}{10} = 2\frac{1}{2}$$

$$16. 3\frac{2}{5} - 2\frac{3}{5} = 1\frac{4}{5}$$

$$17. 5\frac{5}{8} - 2\frac{3}{8} = 3\frac{2}{8} = 3\frac{1}{4}$$

$$18. 6\frac{3}{4} - 1\frac{2}{3} = 5\frac{1}{12}$$

$$19. 3\frac{7}{10} - 1\frac{2}{5} = 2\frac{3}{10}$$

$$20. 7\frac{3}{5} - 4\frac{1}{4} = 3\frac{7}{20}$$

250 Adding and subtracting mixed numerals

## USING THE BOOK

Read through the first problem posed in the pupil display (i.e., Darin's part-time job). Move through the steps required to find the answer as presented in the Initial Activity.

Have the students look at the second problem in the display (i.e.,  $3\frac{1}{4} + 2\frac{1}{3}$ ). Stress the intermediate step required (i.e., the change to equivalent fractions with like denominators).

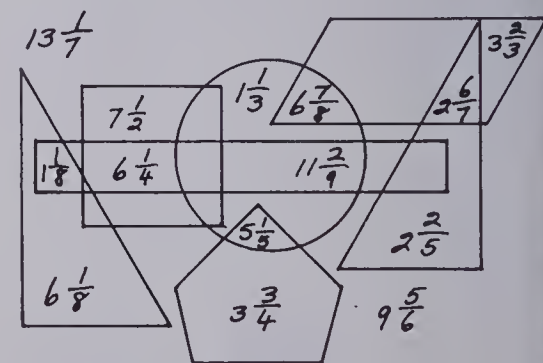
Repeat for the third example (i.e.,  $2\frac{1}{10} + 6\frac{3}{5}$ ).

You may wish to complete Exercises 1, 2, 7, and 8 orally using the chalkboard before assigning the rest. Also, alert the students to the subtraction operation required for Exercises 13 to 20 (there is no regrouping required). Elicit from them that the process will be basically the same. The only difference is the new operation.

## ACTIVITIES

1. To review the idea of multiples see the ideas listed under Activities on page 218 of the teaching notes.

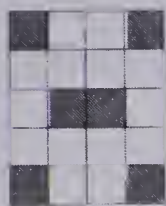
2. Prepare a "Numbers in Shapes" activity by displaying a drawing similar to this on the chalkboard. Use different coloured markers, especially if similar shapes are used (e.g., a red triangle, a blue triangle, etc.).



Prepare question cards such as these.

- What is the sum of the numbers in the pentagon?
- What is the sum of the numbers in the square?
- (c)-(g) Sum the numbers in the parallelogram. Repeat for the other 4 shapes.
- Which triangle has the greater sum?
- Which mixed numeral is in the pentagon but not in the circle?

## Ratios



Ratios are number comparisons

This design has 20 squares.  
6 are red and 14 are white

The ratio of red squares to  
all the squares is 6 to 20.

The ratio of white squares to  
all the squares is 14 to 20



The ratio 6 to 20 can also be written as 6:20 or  $\frac{6}{20}$ .

The ratio 14 to 20 can also be written as 14:20 or  $\frac{14}{20}$ .

### Exercises


1.



- How many diamond shapes are there? **30**
- How many diamonds are red? **17**
- How many diamonds are white? **13**
- What is the ratio of red diamonds to all the diamonds? **17:20**
- What is the ratio of white diamonds to all the diamonds? **13:20**

2.



- There are a total of 16  shapes.
- What is the ratio of the gray to the total number? **4:16**
  - What is the ratio of the red to the total number? **6:16**
  - What is the ratio of the white to the total number? **6:16**

★ 3. Make up designs.

Use 2 or 3 colours and record the ratios in short statements.

Concept of ratios 251

## OBJECTIVE

To introduce the concept of ratios

## PACING

Level A 1, 2  
Level B 1-3  
Level C 1-3

## VOCABULARY

ratio, comparisons

## MATERIALS

graph paper, various sets of common classroom objects

## BACKGROUND

A ratio is a simple numerical comparison. An understanding of ratio is a prerequisite to understanding and working with percent.

## SUGGESTIONS

**Initial Activity** Define some obvious ratios (or comparisons) in the class.

- Ratio of  $\frac{\text{boys}}{\text{total class}}$
- Ratio of  $\frac{\text{girls}}{\text{total class}}$
- Ratio of  $\frac{\text{girls}}{\text{boys}}$
- Ratio of  $\frac{\text{boys}}{\text{girls}}$
- Ratio of  $\frac{\text{students}}{\text{desks}}$
- Ratio of  $\frac{\text{chairs}}{\text{desks}}$

Write ratios in various ways.

**Examples**

- Ratio of girls to boys is 17 to 15.
- $\frac{\text{chairs}}{\text{desks}} = \frac{35}{32}$
- chairs:desks = 35:32

## USING THE BOOK

You may wish to use this exercise as a way of illustrating ways of recording ratios.

In Exercise 1 have the students find the answers to parts (a), (b), and (c). Use these facts to record the ratios. The ratio in part (d) red to all = 17 to 30, or  $\frac{\text{red}}{\text{all}} = \frac{17}{30}$ , or red:all = 17:30.

In part (e), white to all = 13 to 30, or  $\frac{\text{white}}{\text{all}} = \frac{13}{30}$ , or white:all = 13:30.

Discuss and record the answers to Exercise 2 in a similar way.

For Exercise 3 have students make their designs on grid paper. Remind them that the parts of the design must be equal-sized parts.

## ACTIVITIES

1. Have students identify and record five ratios in these areas.

- classroom
- gymnasium storeroom
- parking lot
- home

2. Have the students make up designs as in Exercise 3.

3. Use card sets as illustrated to play "Triple Concentration". The rules for "Concentration" are in the Activity

Reservoir. The only exception here is that players must identify all three cards to win the set.

6 to 20	4 to 10	19 to 32
↕	↕	↕
6:20	4:10	19:32
↕	↕	↕
$\frac{6}{20}$	$\frac{4}{10}$	$\frac{19}{32}$



OBJECTIVE

To solve word problems involving ratios and statistics

PACING

- Level A 1-4(a), 5, 6
- Level B All
- Level C All

MATERIALS

sports section of the newspaper

RELATED AIDS

HMS — DM62.

SUGGESTIONS

**Initial Activity** Review the meaning of ratios as number comparisons as presented on page 251. Use the sports section of a local newspaper to discuss some of the statistics found there. Be sure to introduce terms such as: (a) goals to games ratio, (b) points to games ratio, (c) assists to games ratio; (d) goals to total points ratio and define total points as goal points plus assist points (1 point each for each).

USING THE BOOK

Suggest a reasonable method for recording ratios such as

Mike's goals / games = 30 / 24

Exercises 4(b) and (c) imply a comparison of ratios. (Calculators may assist in this comparison by expressing the ratio as a decimal.)  
Exercise 5 should lead to a discussion of the team player verses the high scorer. There is no best player based solely on this information. An argument could be made for any of them being the "best" player.

ACTIVITIES

1. Have the students compare statistics of their own choosing as suggested in Exercise 6.
2. Gather statistics for the following activities which could be done in the gymnasium.
  - (a) The ratio of baskets made to total number of shots.
  - (b) The ratio of bean bags thrown into a hoop from 7 m away (out of 10 shots).
3. Students might enjoy planning an indoor or outdoor Events Day which would produce ratios. If students moved between 8 to 10 events in groups of 3, they could record each others' statistics. These could then be discussed and presented as ratios afterwards.
  - (a) Ring toss (10 shots)

Hockey Ratios

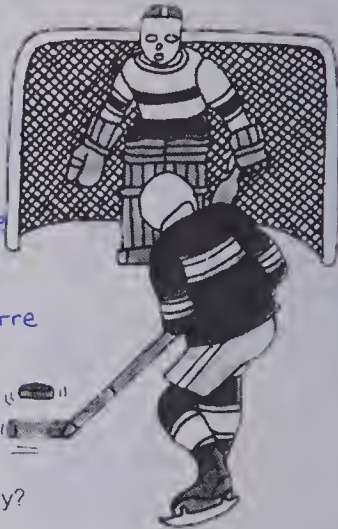
Name	Games Played	Goals	Assists	Points
Mike	24	30	14	44
Gerard	24	21	23	44
Norm	24	7	28	35
Sergio	24	18	10	28
Pierre	24	12	34	46

These are the hockey statistics for five players on the local bantam hockey team.  
Points = Goals + Assists

Exercises

Refer to the chart.

- 1. (a) List each player's goals to games ratio.  
(b) Which player has the highest goals to games ratio? *Mike*
- 2. (a) List each player's points to games ratio.  
(b) Which player has the highest points to games ratio? *Pierre*
- 3. (a) List each player's assists to games ratio.  
(b) Which player has the highest assists to games ratio? *Pierre*
- 4. (a) List each player's goals to points ratio.  
★ (b) Which player has the highest goals to points ratio? *Mike*  
★ (c) Which player has the lowest goals to points ratio. *Norm*
- 5. Which player do you think is the best player on this team? Why?
- 6. Gather some local hockey statistics and compare player's goal, assist, and point ratios.



252 Ratio problems

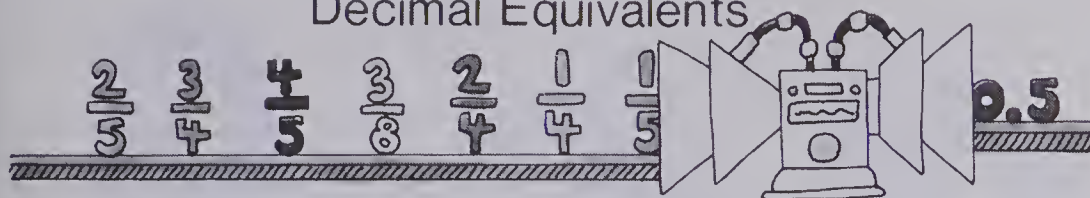
ANSWERS:

1. (a) Mike: 30:24; Gerard: 21:24; Norm: 7:24; Sergio: 18:24; Pierre: 12:24
2. (a) Mike: 44:24; Gerard: 44:24; Norm: 35:24; Sergio: 28:24; Pierre: 46:24
3. (a) Mike: 14:24; Gerard: 23:24; Norm: 28:24; Sergio: 10:24; Pierre: 34:24
4. (a) Mike: 30:44; Gerard: 21:44; Norm: 7:35; Sergio: 18:28; Pierre: 12:46

- (b) Bean bag toss (10 tosses)
- (c) Lawn darts
- (d) Croquet shots through a hoop from 2 m

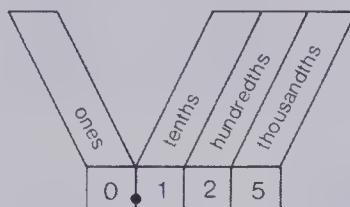


## Decimal Equivalents



Any common fraction which can be expressed in tenths, hundredths, or thousandths can be changed to a decimal fraction.

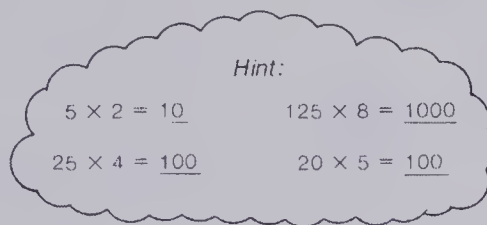
Example  $\frac{1}{2} = \frac{1 \times 5}{2 \times 5} = \frac{5}{10} = 0.5$   
 $\frac{1}{4} = \frac{1 \times 25}{4 \times 25} = \frac{25}{100} = 0.25$   
 $\frac{1}{5} = \frac{1 \times 2}{5 \times 2} = \frac{2}{10} = 0.2$   
 $\frac{1}{8} = \frac{1 \times 125}{8 \times 125} = \frac{125}{1000} = 0.125$



### Exercises

Express each as a decimal fraction.

$\frac{3}{4} = \frac{3 \times 25}{4 \times 25} = \frac{75}{100} = 0.75$   
 $\frac{4}{5} = \frac{4 \times 2}{5 \times 2} = \frac{8}{10} = 0.8$   
 $\frac{3}{8} = \frac{3 \times 125}{8 \times 125} = \frac{375}{1000} = 0.375$



- |                           |                            |                            |                            |                            |
|---------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| 4. $\frac{1}{4} = 0.25$   | 5. $\frac{3}{5} = 0.6$     | 6. $\frac{7}{10} = 0.7$    | 7. $\frac{2}{5} = 0.4$     | 8. $\frac{3}{10} = 0.3$    |
| 9. $\frac{1}{20} = 0.05$  | 10. $\frac{7}{20} = 0.35$  | 11. $\frac{11}{20} = 0.55$ | 12. $\frac{13}{20} = 0.65$ | 13. $\frac{19}{20} = 0.95$ |
| 14. $\frac{1}{25} = 0.04$ | 15. $\frac{4}{25} = 0.16$  | 16. $\frac{9}{25} = 0.36$  | 17. $\frac{19}{25} = 0.76$ | 18. $\frac{24}{25} = 0.96$ |
| 19. $\frac{5}{8} = 0.625$ | 20. $\frac{7}{8} = 0.875$  | 21. $\frac{5}{4} = 1.25$   | 22. $\frac{7}{5} = 1.4$    | 23. $\frac{13}{10} = 1.3$  |
| 24. $\frac{19}{10} = 1.9$ | 25. $\frac{27}{20} = 1.35$ | 26. $\frac{35}{20} = 1.75$ | 27. $\frac{31}{25} = 1.24$ | 28. $\frac{50}{25} = 2$    |

Expressing fractions as decimal fractions 253

## ACTIVITIES

1. Have the students complete the following patterns. When discussing this activity have students share their strategies with the class. There are many. Some are easier to understand than others.

(a)  $\frac{1}{4} = 0.25$  (b)  $\frac{1}{5} = 0.2$   
 $\frac{2}{4} = \underline{\quad}$   $\frac{2}{5} = \underline{\quad}$   
 $\frac{3}{4} = \underline{\quad}$   $\frac{3}{5} = \underline{\quad}$   
 $\frac{4}{4} = 1.00$   $\frac{4}{5} = \underline{\quad}$   
 $\frac{5}{5} = 1.00$

(c)  $\frac{1}{20} = 0.05$  (d)  $\frac{1}{25} = 0.04$   
 $\frac{2}{20} = \underline{\quad}$   $\frac{2}{25} = \underline{\quad}$   
 $\frac{3}{20} = \underline{\quad}$   $\frac{3}{25} = \underline{\quad}$   
 $\frac{20}{20} = 1.00$   $\frac{25}{25} = 1.00$

(e)  $\frac{1}{8} = 0.125$   $\frac{5}{8} = \underline{\quad}$   
 $\frac{2}{8} = 0.250$  or  $0.25$   $\frac{6}{8} = \underline{\quad}$   
 $\frac{3}{8} = \underline{\quad}$   $\frac{7}{8} = \underline{\quad}$   
 $\frac{4}{8} = \underline{\quad}$   $\frac{8}{8} = 1.00$

2. Have students write the following fractions and decimals on 20 cm by 10 cm cards. Cut each card into a unique 2 part jigsaw puzzle.



These fractions and their decimal equivalents could be used.

$\frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}, \frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \frac{5}{5}$   
 $\frac{1}{20} \rightarrow \frac{20}{20}, \frac{1}{25} \rightarrow \frac{25}{25}, \frac{1}{8} \rightarrow \frac{8}{8}$

Place the jigsaw cards into a centre where students can match these fraction decimal equivalents.

3. Play "Dominoes" as described in the Activity Reservoir.

## OBJECTIVE

To express fractions (ratios) as decimals

## PACING

Level A 1-20  
 Level B 1-24  
 Level C 1-28

## BACKGROUND

All the fractions in this exercise also could be referred to as ratios.

## SUGGESTIONS

**Initial Activity** Review place value as presented on pages 24 and 25. Have students read, write on the chalkboard, and explain various numbers with up to three decimal places. Place special emphasis on reading decimal amounts such as 0.5, 0.2, and 0.8 as "five tenths, two tenths, and eight tenths".

Review the standard method of finding equivalent fractions, especially for fractions such as  $\frac{1}{2}$ ,  $\frac{1}{5}$ , and  $\frac{4}{5}$ , to yield  $\frac{5}{10}$ ,  $\frac{2}{10}$ , and  $\frac{8}{10}$ . Have these read as "five tenths, two tenths, and eight tenths".

Emphasize that 0.5 and  $\frac{5}{10}$  can be read the same way and that they represent equal amounts. Repeat for other fractions which can be changed to tenths, hundredths, and thousandths, (e.g.,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ,  $\frac{3}{4}$ , etc.).

## USING THE BOOK

Read through the information at the top of the pupil page highlighting what was demonstrated in the Initial Activity. Emphasize that many fractions can be written as tenths, hundredths, and thousandths (as equivalent fractions) and, therefore, as decimals. We have not altered the *amounts* expressed, just the way of expressing the amounts.

Complete Exercises 1 to 3 orally as a guide to procedure and workbook answer format. Assign the exercises.

You may wish to point out that the multiplication information listed under "Hint" may be of some help while they complete their assignment.

## OBJECTIVE

To introduce percents

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

percent

## MATERIALS

newspaper advertisements using percents (optional)

## BACKGROUND

If all ratios are compared to 100, then they are easier to compare to each other.

## SUGGESTIONS

**Initial Activity** Discuss where percents are used in society (i.e., sales tax, discount sales, etc.). List these. Point out that a percent is a special ratio meaning "compared to 100". Any fraction or ratio which has an equivalent in hundredths can be expressed easily as a percent.

### Examples

$\frac{8}{10} = \frac{8 \times 10}{10 \times 10} = \frac{80}{100} = 80\%$  (Read as "eighty percent".)  
 $\frac{17}{50} = \frac{17 \times 2}{50 \times 2} = \frac{34}{100} = 34\%$  (Read as "thirty-four percent".)

## USING THE BOOK

After reading the information at the top of the pupil page and stressing that "percent" is an amount compared to 100, complete Exercises 1, 2, 9, and 10 orally and/or at the chalkboard.


Discuss how the percent sign may have come about (at the bottom of pupil page) before assigning the exercises.

## ACTIVITIES


- Fiftieths and percents. Have each student:
  - cut out two 5 cm  $\times$  10 cm (50 cm<sup>2</sup>) rectangles from centimetre grid paper.
  - shade in some of the squares in a pattern, or randomly.
  - mount the grid on coloured construction paper. Sign your name on the back.
  - use the class set of 40 to 60 grids to make two to five work centres for expressing  $\frac{\blacksquare}{50}$  as  $\frac{\blacksquare}{100}$  and  $\blacksquare\%$ .
- Twenty-fifths and percents. Follow the steps in Activity 1 to create

### The Special Ratio

John scored  
70% on his  
math test.



SPECIAL!  
New size has  
25% more!

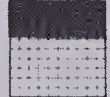


A **percent** is an amount compared to 100. Percent means "per hundred".

Susan achieved  $\frac{66}{100}$  on a test.  
Her score is 66%.

Sam achieved  $\frac{8}{10}$  on a test.  
His score is  $\frac{80}{100}$  or 80%.


#### Exercises



(a) What is the ratio of red squares to all the squares?  $\frac{40}{100}$

(b) What percent are coloured red? 40%

(c) What percent are white? 60%



(a) What is the ratio of the red squares to all of the squares?  $\frac{70}{100}$

(b) What percent are red? 70%

(c) What percent are white? 30%

Change the following ratios to percents.

3. 65:100 65% 4. 15:100 15% 5. 25:100 25% 6.  $\frac{12}{100}$  12% 7.  $\frac{85}{100}$  85% 8.  $\frac{75}{100}$  75%

Write each as a percent.

9.  $\frac{4}{10} = \frac{4 \times 10}{10 \times 10} = \frac{40}{100} = 40\%$

11.  $\frac{7}{10} = \frac{70}{100} = 70\%$

13.  $\frac{1}{10} = 10\%$

17.  $\frac{29}{50} = 58\%$

10.  $\frac{17}{50} = \frac{17 \times 2}{50 \times 2} = \frac{34}{100} = 34\%$

12.  $\frac{35}{50} = \frac{70}{100} = 70\%$

14.  $\frac{44}{50} = 88\%$

18.  $\frac{50}{50} = 100\%$

15.  $\frac{6}{10} = 60\%$

19.  $\frac{9}{10} = 90\%$

16.  $\frac{3}{50} = 6\%$

20.  $\frac{10}{10} = 100\%$

The % sign:

$\frac{\blacksquare}{100}$  becomes  $\blacksquare / 100$  becomes  $\blacksquare / 100$  becomes  $\blacksquare\%$

5 cm  $\times$  5 cm (25 cm<sup>2</sup>) patterned, square grids which will be used for expressing  $\frac{\blacksquare}{25}$  as  $\frac{\blacksquare}{100}$  and  $\blacksquare\%$ .

- See "Batter Up" as described in the Activity Reservoir.

## Equivalent Ratios

In a hockey league, Rose had 12 points in 8 games played. Harold had 10 points in 7 games played.

The ratios of points to games were:

Rose:  $\frac{12}{8}$       Harold:  $\frac{10}{7}$

$$\begin{array}{l} 12 \times 7 \rightarrow 8 \times 10 = 80 \\ 8 \times 7 \rightarrow 12 \times 10 = 84 \end{array}$$

$$80 \neq 84$$

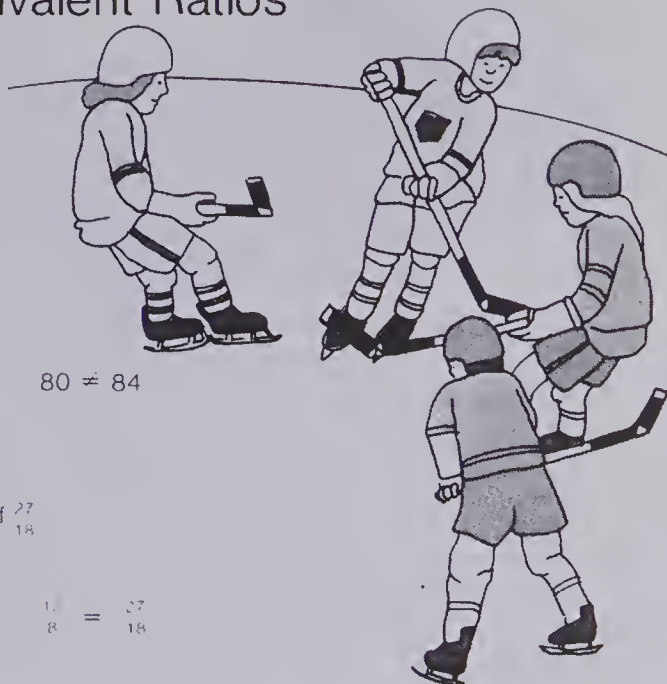
The ratios are not equivalent

Randy had a ratio of points to games of  $\frac{27}{18}$ .  
Is Randy's ratio equivalent to Rose's?

$$\begin{array}{l} 12 \times 27 \rightarrow 8 \times 27 = 216 \\ 8 \times 18 \rightarrow 12 \times 18 = 216 \end{array}$$

$$\frac{12}{8} = \frac{27}{18}$$

Their ratios are equivalent.



## OBJECTIVE

To use cross products to check for equivalent ratios

## PACING

Level A 1-5

Level B 1-7

Level C All

## VOCABULARY

cross products, equivalent,  $\neq$

## BACKGROUND

This page is intended as a follow up to pages 242 and 243. The ideas are closely related. You may wish to bring this similarity to the attention of the students.

## SUGGESTIONS

**Initial Activity** Using ratios that students know are equivalent, such as  $\frac{1}{2}$  and  $\frac{5}{10}$ , show that their cross products are equal.

*Examples*

$$(a) \frac{1}{2} \text{ and } \frac{5}{10} \rightarrow \begin{array}{l} 1 \times 5 = 5 \\ 2 \times 10 = 20 \end{array}$$

$$\text{Thus } \frac{1}{2} = \frac{5}{10}.$$

$$(b) \text{ Also } \frac{2}{3} \text{ and } \frac{16}{24}$$

$$\frac{2}{3} \text{ and } \frac{16}{24} \rightarrow \begin{array}{l} 2 \times 24 = 48 \\ 3 \times 16 = 48 \end{array}$$

$$\text{Thus } \frac{2}{3} = \frac{16}{24}.$$

(c) But  $\frac{2}{5}$  and  $\frac{3}{7}$  are not equivalent.

$$\frac{2}{5} \text{ and } \frac{3}{7} \rightarrow \begin{array}{l} 2 \times 7 = 14 \\ 5 \times 3 = 15 \end{array}$$

$$\text{Thus } \frac{2}{5} \neq \frac{3}{7}.$$

## USING THE BOOK

Assign the exercises to the more capable students. Check Exercises 1 and 2 with the less capable students before allowing them to proceed.

## ACTIVITIES

If you haven't done so already, see the Activities listed on page 242.

### Exercises

Use cross products. Replace  $\bullet$  with  $=$  or  $\neq$

$$1. \frac{4}{5} \bullet \frac{8}{24} \rightarrow \begin{array}{l} 4 \times 24 = 96 \\ 5 \times 8 = 40 \end{array} \neq$$

$$2. \frac{7}{9} \bullet \frac{49}{63} \rightarrow \begin{array}{l} 7 \times 63 = 441 \\ 9 \times 49 = 441 \end{array} =$$

$$3. \frac{3}{5} \bullet \frac{6}{10} =$$

$$4. \frac{4}{6} \bullet \frac{8}{12} =$$

$$5. \frac{3}{7} \bullet \frac{10}{21} \neq$$

$$6. \frac{7}{8} \bullet \frac{36}{40} \neq$$

$$7. \frac{8}{12} \bullet \frac{4}{5} \neq$$

$$8. \frac{17}{20} \bullet \frac{4}{5} \neq$$

$$9. \frac{4}{12} \bullet \frac{5}{15} =$$

$$10. \frac{3}{10} \bullet \frac{2}{6} \neq$$



OBJECTIVE

To solve word problems involving ratios

PACING

- Level A All
- Level B All
- Level C All

MATERIALS

centimetre grid paper for the graph in Exercise 3

BACKGROUND

Discuss the duties performed by the librarian in a school, a public library, or a bookmobile.

SUGGESTIONS

**Initial Activity** Review Professor Q's four questions (see page 4). List these on a chart so that students can refer to them.

USING THE BOOK

Assign the exercises. Encourage students to make a brief statement for each answer.

*Example*

- 1. (a) Mr. Toms ordered \_\_\_\_ new books.
- (b) The ratio of sport books to fiction books is \_\_\_\_ to \_\_\_\_.

ACTIVITIES

- 1. Have the students:
  - (a) make up two more word problems related to the library or on librarians.
  - (b) write a complete solution for each problem.
  - (c) check the wording and solutions with the teacher.
  - (d) write the two problems on a page. Illustrate the problems.
  - (e) bind groups of four to six problems in a mini-book. Design a cover for the book.
- 2. Place the mini-books in a library problem-solving centre in the class. Allow students to solve three to six problems of their choice from the centre.



- 1. Mr. Toms ordered new books for the library. He ordered 42 books on sports, 26 books on animals, 32 books on history, and 54 books on fiction.
  - (a) How many books did he order in all?  $154$
  - (b) What is the ratio of sport books to fiction books ordered?  $42 : 54$  or  $\frac{42}{54}$
  - (c) What is the ratio of history books to fiction books ordered?  $32 : 54$  or  $\frac{32}{54}$
  - (d) What is the ratio of fiction books to total books ordered?  $54 : 154$  or  $\frac{54}{154}$
- 2. The ratio of books borrowed on Monday to total books borrowed for the week is  $\frac{1}{10}$ . The ratio of books borrowed on Saturday to total books borrowed for the week is  $\frac{3}{12}$ . Are the two ratios equivalent?  $No$
- 3. Ask the librarian in your school to help you fill this chart.

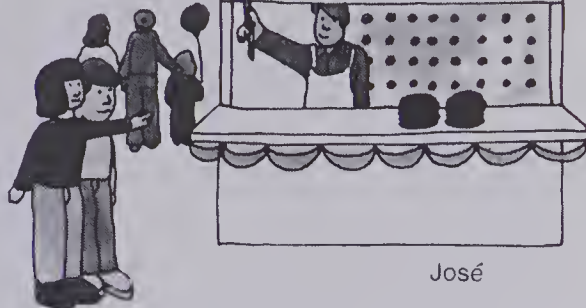
Number of Books Borrowed by Different Classes

Class	Monday	Tuesday	Wednesday	Thursday	Friday	Total
A						
B						
C						

Draw a graph of the total books borrowed by the different classes

## The School Fair

At the "Ring Toss" booth Nina put 8 out of 25 rings on the target and José put 7 out of 20 rings on the target.  
Who had the better "Ring Toss" percentage?



Nina

$$\frac{8}{25} = \frac{8 \times 4}{25 \times 4} = \frac{32}{100}$$

$$= 32\%$$

José

$$\frac{7}{20} = \frac{7 \times 5}{20 \times 5} = \frac{35}{100}$$

$$= 35\%$$

José had the better tossing percentage

### Exercises

Express each as a percent.

$$\frac{1}{2} = \frac{1 \times 50}{2 \times 50} = \frac{50}{100} = 50\%$$

$$\frac{3}{4} = \frac{3 \times 25}{4 \times 25} = \frac{75}{100} = 75\%$$

1. $\frac{4}{5} = 80\%$	4. $\frac{3}{10} = 30\%$	5. $\frac{1}{4} = 25\%$	6. $\frac{13}{20} = 65\%$	7. $\frac{7}{20} = 35\%$
8. $\frac{2}{25} = 8\%$	9. $\frac{17}{25} = 68\%$	10. $\frac{21}{25} = 84\%$	11. $\frac{1}{50} = 2\%$	12. $\frac{8}{50} = 16\%$
13. $\frac{45}{50} = 90\%$	14. $\frac{9}{10} = 90\%$	15. $\frac{3}{5} = 60\%$	16. $\frac{9}{20} = 45\%$	17. $\frac{3}{100} = 3\%$

18. At the "Dart Throwing" booth Greg hit 7 stars with 25 darts and Brenda hit 3 stars with 10 darts.  
Who had the better dart throwing percentage? **Brenda**

## OBJECTIVE

To express fractions as percents

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

percentage

## SUGGESTIONS

**Initial Activity** Review some multiplication facts related to products of 100.

**Examples**

$2 \times \blacksquare = 100$	$50 \times \blacksquare = 100$
$4 \times \blacksquare = 100$	$25 \times \blacksquare = 100$
$10 \times \blacksquare = 100$	$20 \times \blacksquare = 100$

Review equivalent fractions using examples where the new denominator is 100.

$$\frac{7}{10} = \frac{7 \times 10}{10 \times 10} = \frac{70}{100}$$

Express  $\frac{70}{100}$  as a percent.  $\frac{70}{100} = 70\%$ .

## USING THE BOOK

Explain how  $\frac{8}{25} = \frac{32}{100} = 32\%$  and how

$$\frac{7}{20} = \frac{35}{100} = 35\%$$

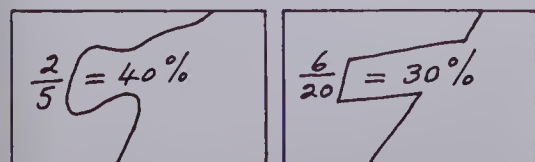
as a review of the skills learned on page 254.

Assign the exercises. Check Exercises 1, 2, and 3 when these exercises are done.

## ACTIVITIES

- Have the students:
  - write two School Fair ratio problems.
  - write the solutions.
  - check the solutions with the teacher.
  - file the problems in a folder so other classmates can try to solve the problems.
- Make a class set of percent equivalent, jigsaw cards. Each card is 20 cm × 10 cm. (See page 253, Activity 2.)

**Examples**



Use these fractions and their equivalent percents.

$$\frac{1}{2}, \frac{2}{2}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}, \frac{1}{5} \rightarrow \frac{5}{5}, \frac{1}{10} \rightarrow \frac{10}{10},$$

$$\frac{1}{20} \rightarrow \frac{20}{20}, \frac{1}{25} \rightarrow \frac{25}{25}, \frac{1}{50} \rightarrow \frac{50}{50}.$$

Assign each student three or four fractions with differing jigsaw drill cards. Place the cards in groups of ten for individual practice.

- Play "Bingo" as described in the Activity Reservoir. Write 25 percent amounts on the chalkboard from which the players may choose to fill in their Bingo blanks randomly. Have the "caller" identify corresponding fraction amounts. (25 pairs of matching cards from Activity 2 would be a good source.)

## OBJECTIVE

To express percents as decimals and ratios as percents

## PACING

Level A 1-14  
Level B 1-15  
Level C 1-16

## RELATED AIDS

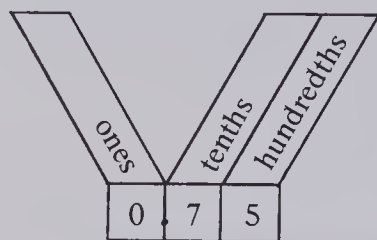
HMS — DM63.

## SUGGESTIONS

**Initial Activity** Review that percent means "compared to 100".

Thus 75% means  $\frac{75}{100}$ .

$\frac{75}{100}$  as a decimal is



## USING THE BOOK

Note that there are two types of exercises on this page (i.e., expressing percents as decimals and expressing ratios as percents).

Read through the information at the top of the pupil page and consolidate the ideas presented; namely, (a) percent amounts can be written as fractions, (b) fractions (or ratios) can be written as decimals, (c) the amounts expressed haven't changed just the manner in which they are expressed.

Point out that, of the three percent examples expressed in the place-value chart as decimals, two of them are the same (i.e.,  $0.20 = 0.2$ ).

Complete Exercises 1 and 2 orally. Also, review a problem like Exercise 11.

### Example

Jennifer saves 25 cents out of every dollar she earns. What percent does she save?

$$\frac{\text{Savings}}{\text{Total}} = \frac{25}{100}$$

$$\frac{25}{100} = 25\%$$

Jennifer saves 25% of her earnings.

Assign the exercises.

## ACTIVITIES

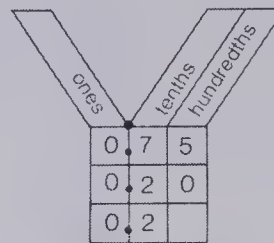
1. Using a section of the newspaper, students scan each page for advertisements or articles which involve percent signs. Clip the information and paste it in a workbook. Use the information to:

## Percents as Decimals

Percent is a comparison to 100.

Fractions with a denominator of 100 can be written as decimals.

$$75\% = \frac{75}{100} = 0.75$$



$$20\% = \frac{20}{100} = 0.20 \text{ or } 0.2$$

$$20\% = \frac{20}{100} = \frac{2}{10} = 0.2$$

### Exercises

Express as decimals.

$$25\% = \frac{25}{100} = 0.25$$

$$3. 45\% = 0.45$$

$$4. 50\% = 0.5$$

$$16\% = \frac{16}{100} = 0.16$$

$$5. 80\% = 0.8$$

$$6. 10\% = 0.1$$

$$7. 67\% = 0.67$$

$$8. 35\% = 0.35$$

$$9. 72\% = 0.72$$

$$10. 99\% = 0.99$$

Solve.

11. Out of every dollar Julie earns she saves 15¢.  
What percent does she save?  $15\%$

13. Mr. Johnson earns \$1000 per month and pays \$320 for rent.

- (a) What percent of his salary does he pay in rent?  $32\%$   
(b) What percent is used for other expenses?  $68\%$

15. A basketball player tried to score 20 times in a game.

- Nine shots were successful.  
(a) What percent of the shots scored?  $45\%$   
(b) What percent of the shots did not score?  $55\%$

12. In a swimming class of 100 people, 42 are girls.  
What percent are girls?  $42\%$

14. Mr. and Mrs. Johnson save \$12 for every \$100 earned

- (a) What percent do they save?  $12\%$   
(b) What percent do they spend?  $88\%$

16. An archer scored 17 bull's-eyes and 81 outer rings in 100 shots.

- (a) What percent hit the bull's-eye?  $17\%$   
(b) What percent hit the outer ring?  $81\%$   
(c) What percent missed the target?  $2\%$

- (a) write an equivalent fraction or ratio.  
(b) write an equivalent decimal.  
(c) write a problem and solve it.

2. Choose a percentage between 1% and 100% and write the next 15 whole number percents. Then express each percentage as a decimal.

### Example

John chose 25%.

He would write 25%, 26%, 27%, up to 40% and write decimals for each.

$$25\% = \frac{25}{100} = 0.25$$

3. See "Spider and the Fly" as described in the Activity Reservoir. Use skills cards such as:

$$0.25 = \blacksquare\%$$

$$\frac{1}{5} = \blacksquare\%$$

$$3:50 = \blacksquare$$



## Susan's Paper Route

Susan has a paper route.  
She collects \$42 from her customers each week.  
She keeps 20% of this amount.  
How much does she earn per week?

Step 1 Change 20% to a decimal.

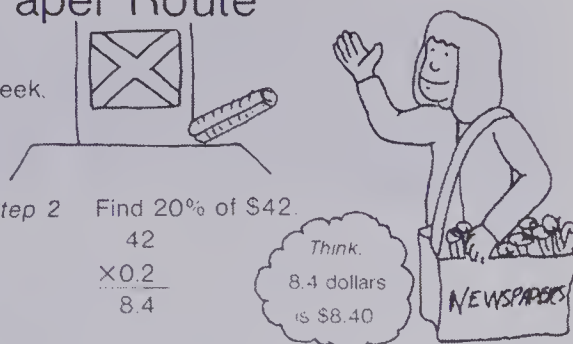
$$20\% = \frac{20}{100} = 0.20 = \boxed{0.2}$$

She earns \$8.40 per week.

Step 2 Find 20% of \$42.

$$\begin{array}{r} 42 \\ \times 0.2 \\ \hline 8.4 \end{array}$$

Think.  
8.4 dollars  
is \$8.40



### Exercises

Calculate.

1. 10% of \$32 **\$ 3.20**

3. 20% of \$11 **\$ 2.20**

5. 70% of \$5 **\$ 3.50**

7. 80% of \$95 **\$ 76**

9. 10% of \$4 **\$ 0.40**

2. 50% of \$25 **\$ 12.50**

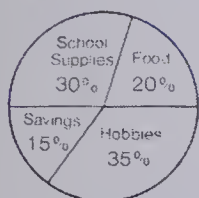
4. 60% of \$45 **\$ 27**

6. 90% of \$35 **\$ 31.50**

8. 30% of \$60 **\$ 18**

10. 30% of \$83 **\$ 24.90**

11.



John's Expenses

John receives an allowance of \$6.00 per week.

How much does he spend on:

(a) school supplies? **\$1.80**

(b) food? **\$1.20**

(c) hobbies? **\$2.10**

(d) How much does he save each week? **\$0.90**

(e) Add all his spendings and savings. What is the sum? **\$6.00**

12. 500 students attend Glenview Public School.

10% sing in the school choir. **50**

40% play intramural sports. **200**

30% are members of the library club. **150**

20% are members of the "Animal Kindness Club". **100**

How many students participate in each of these school activities?

## OBJECTIVE

To find a percent of an amount

## PACING

Level A 1-8

Level B 1-10, 12

Level C All

## RELATED AIDS

CALC. W/BK — 54.

## BACKGROUND

Most of the questions involve a percent which is a multiple of 10. This is done so that all calculations are simple.

## SUGGESTIONS

**Initial Activity** Using 20 or 30 students from the class, show multiples of 10% of this group.

**Examples**

$$10\% \text{ of } 20 = 2 \quad 10\% \text{ of } 30 = 3$$

$$20\% \text{ of } 20 = 4 \quad 20\% \text{ of } 30 = 6$$

$$30\% \text{ of } 20 = 6 \quad 30\% \text{ of } 30 = 9$$

$$100\% \text{ of } 20 = 20 \quad 100\% \text{ of } 30 = 30$$

As the teacher shows each 10%, the number of students at the front of the room increases.

Note that 50% of 20 = 10 is the same as half the group.

## USING THE BOOK

Discuss the two steps in calculating a percent of a given amount as shown in the display. Stress that an amount like 8.4 dollars = \$8.40.

You may want the students to list these decimal equivalents for reference.

$$10\% = 0.1$$

$$20\% = 0.2$$

$$30\% = 0.3$$

$$\downarrow$$

$$90\% = 0.9$$

Assign the exercises. For Exercise 11, clarify where students must find their information (i.e., on the circle graph).

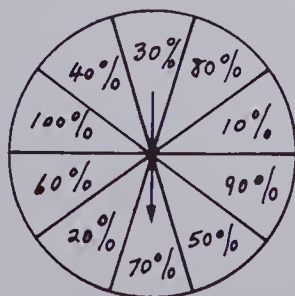
## ACTIVITIES

1. Have available newspaper or sale catalogue advertisements as a source of new prices. Show students this chart.

10% off	Sale price is 90% of regular price.
20% off	Sales price is 80% of regular price.

Have students calculate sale prices for 10 items they would like to purchase.

2. Play "\$core". Prepare a spinner as shown (use a plastic or wooden stir-stick, or large paperclip as an arrow)



and a series of cards which each show dollar amounts (in 5-dollar intervals) from \$0 to \$50. Shuffle the deck. Players take turns twirling the spinner, selecting a card, and calculating their \$core. The player with the highest \$core after a predetermined number of turns wins.

3. Some students might enjoy performing this survey.

(a) Choose 20 people from the class.

(b) Ask each the same five questions (i.e., "Did you have breakfast this morning?" "Do you live in a house or an apartment?" "Do you have brothers and/or sisters?", etc.).

(c) Record the frequency of responses.

(d) Calculate the percentages of the class that answered in various ways (e.g., "80% of our class had breakfast this morning." etc.).

(e) Display or present the results to the rest of the class.

## EXTRA PRACTICE

1. Find all multiples of 10% of \$400.

2. Find all multiples of 10% of \$750.

## OBJECTIVE

To solve problems involving percent

## PACING

Level A 1-6  
Level B 1-6, 8  
Level C 1-9

## VOCABULARY

semidetached and detached homes, air conditioning, broadloom, carpeted, down payment, real estate company

## RELATED AIDS

HMS — DM64.

## BACKGROUND

These problems involve finding percentages and also finding a percent of a given amount.

## SUGGESTIONS

**Initial Activity** Discuss the many responsibilities that a building contractor has. (See the Career Awareness notes on page 228 of the teaching notes.)

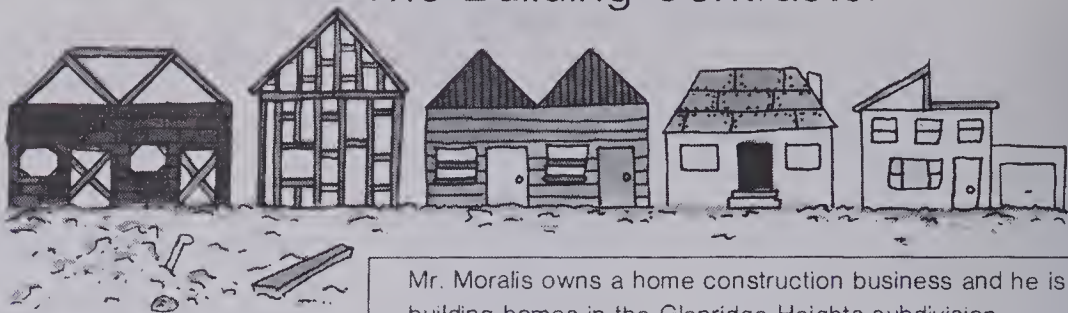
## USING THE BOOK

Have the students read the problems on pages 260 and 261. Allow them to ask questions about the sense of the problems.

**Examples**

What is a down payment?  
Why are semidetached homes less expensive?

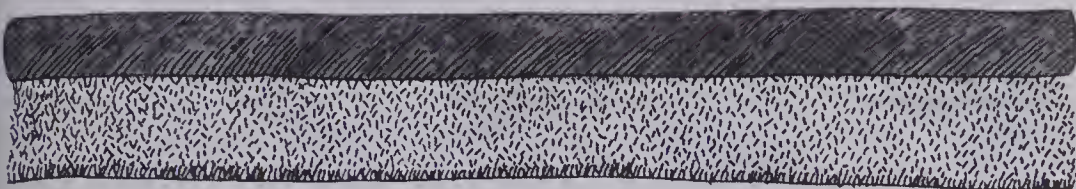
## The Building Contractor



### Exercises

- The subdivision has 50 homes, 30 of which are semidetached and the rest are detached.
- What percent of the homes are semidetached?  $60\%$
  - How many homes are detached homes?  $20$
  - What percent of the homes are detached homes?  $40\%$
2. Of the 50 homes, 40% of the homes have 4 bedrooms, 50% have 3 bedrooms, and 10% have 2 bedrooms.
- How many homes have 4 bedrooms?  $20$
  - How many homes have 3 bedrooms?  $25$
  - How many homes have 2 bedrooms?  $5$
3. Of the 20 detached homes, 30% are being built with central air conditioning.
- How many homes have central air conditioning?  $6$
  - How many homes do not have central air conditioning?  $14$
4. 27 of the 50 homes have 3 bathrooms and the rest have 2 bathrooms.
- What percent of the homes have 3 bathrooms?  $54\%$
  - What percent of the homes have 2 bathrooms?  $46\%$



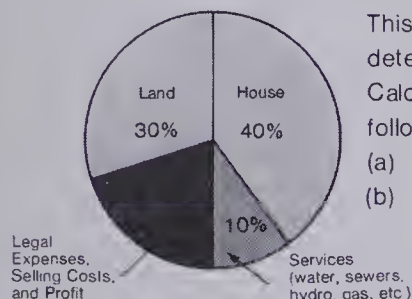


5. When all 50 homes were sold, 90% of the buyers selected wall-to-wall broadloom. The rest chose hardwood floors.
  - (a) How many homes were carpeted? **45**
  - (b) How many homes had hardwood floors? **5**
6. After 3 months  $\frac{4}{5}$  of the 50 homes were sold.
  - (a) What percent of the homes were sold? **80%**
  - (b) How many homes were sold? **40**
  - (c) How many were still for sale? **10**

- ★ 7. The minimum down payment that the purchaser could make is 10% of the total price.
  - (a) What is the minimum down payment allowed on a semidetached home which sells for \$60 000? **\$6000**
  - (b) What is the minimum down payment allowed on a single home which sells for \$85 000? **\$8500**

- ★ 8. The real estate company received \$4000 for selling a house valued at \$80 000. What percent of the selling price did they receive? **5%**

★ 9.



This circle graph shows the approximate costs which determine the selling price of a new home. Calculate the cost of each for the contractor for the following sales.

- (a) A large 4 bedroom detached home selling for \$90 000.
- (b) A semidetached home selling for \$65 000.

Percent problems 261

## ACTIVITIES

1. Make a copy on the chalkboard or bulletin board of a simplified floor plan for a house as shown. Note that the total floor area is 100 m<sup>2</sup> to help simplify the calculation of percent amounts, and that doors and windows, which may cause confusion, are not shown.



Have the students find the answers for problems such as these.

- (a) What is the floor area in square metres for each room?
- (b) What percentage of the total floor area does each room represent?
- (c) What is the total percentage for the five rooms shown?
- (d) How much floor area (in square metres) is used for the halls and stairs?
- (e) What percentage of the total floor area is used for halls and stairs?

2. Some students might enjoy interviewing a building contractor or person who sells new homes. Have them use a tape recorder during the interview. Make sure they plan their questions in advance and share the interview with the class.

3. See Activity 3, page 259. If they have not already done so, some students might enjoy doing this, or expanding the "test group" from 20 classmates to 50 or 100 schoolmates. The results could be collected, calculated, and displayed (as facts and figures or as graphs) in a bulletin-board display somewhere in the school.

### ANSWERS:

9. (a) House: \$36 000; Services: \$9000; Legal Costs, etc.: \$18 000; Land: \$27 000
- (b) House: \$26 000; Services: \$6500; Legal Costs, etc.: \$13 000; Land: \$19 000



## OBJECTIVE

To evaluate achievement of the chapter objectives

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

HMS — DM65.

## USING THE BOOK

Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a large number of students had difficulty with a particular topic or concept.

The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 228).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1-3	A	229-231
11-16	B	233, 234, 246-250
4-10, 28-31	C	236, 238-240
17-19	D	235-237
20-25	E	254
26, 27	F	258, 259
32-35		
36, 37	G	252, 256, 258-261

## Chapter Test

What fraction is shaded?



3. Solve.

$\frac{3}{5}$  of 20 =  $\blacksquare$  12

Which pairs of fractions are equivalent fractions? #5

4.  $\frac{2}{3}$  and  $\frac{5}{6}$

5.  $\frac{6}{9}$  and  $\frac{16}{18}$

6.  $\frac{7}{8}$  and  $\frac{6}{7}$

Make these equivalent fractions.

7.  $\frac{1}{3} = \frac{\blacksquare}{15}$  5

8.  $\frac{2}{5} = \frac{\blacksquare}{20}$  8

9.  $\frac{5}{8} = \frac{\blacksquare}{40}$  25

10.  $\frac{5}{4} = \frac{\blacksquare}{16}$  20

Add or subtract as indicated

11.  $\frac{1}{10} + \frac{7}{10} = \frac{8}{10}$  or  $\frac{4}{5}$

12.  $\frac{1}{4} + \frac{2}{5} = \frac{13}{20}$

13.  $\frac{5}{8} - \frac{3}{8} = \frac{2}{8}$  or  $\frac{1}{4}$

14.  $\frac{1}{2} - \frac{3}{10} = \frac{2}{10}$  or  $\frac{1}{5}$

15.  $3\frac{7}{10} + 2\frac{1}{10} = 5\frac{8}{10}$  or  $5\frac{4}{5}$

16.  $5\frac{3}{4} - 3\frac{1}{3} = 2\frac{5}{12}$

17.  $0.7 + 0.2 + 0.9 = 1.8$

18.  $7.937 + 2.715 = 10.652$

19.  $1872 - 5.16 = 13.56$

Express each as a percent.

20.  $\frac{39}{100} = 39\%$

21.  $\frac{4}{5} = 80\%$

22.  $\frac{11}{25} = 44\%$

23.  $\frac{40}{50} = 80\%$

Write as decimals.

24.  $\frac{87}{100} = 0.87$

25.  $\frac{11}{25} = 0.44$

26.  $32\% = 0.32$

27.  $80\% = 0.8$

Write as a fraction.

28.  $0.8 = \frac{8}{10}$  or  $\frac{4}{5}$

29.  $0.19 = \frac{19}{100}$

30.  $1.3 = 1\frac{3}{10}$

31.  $0.411 = \frac{411}{1000}$

Find

32. 20% of 60 = 12

33. 80% of 150 = 120

34. 30% of \$25 = \$7.50

35. 40% of \$30 = \$12

36. John achieved  $\frac{16}{20}$  on a math test.

What percentage mark would he receive? 80%

37. Joan bought new skates for 80% of the regular price. The regular price was \$24.

What price did she pay? \$19.20

## Cumulative Review

Perform the indicated operations.

$$\begin{array}{r} 1. \quad 17\,327 \\ \quad 5\,283 \\ + \quad 309 \\ \hline 22\,919 \end{array}$$

$$\begin{array}{r} 2. \quad 12.071 \\ \quad - 5.836 \\ \hline 6.24 \end{array}$$

$$\begin{array}{r} 3. \quad \$63.09 \\ \quad \times 5 \\ \hline \$315.45 \end{array}$$

$$\begin{array}{r} 4. \quad 49.6 \\ \quad \times 0.4 \\ \hline 19.84 \end{array}$$

$$5. \quad 42 \overline{)2352} \quad 56$$

$$6. \quad \frac{5}{10} + \frac{3}{10} = \frac{8}{10} \text{ or } \frac{4}{5}$$

$$7. \quad \frac{3}{4} - \frac{2}{5} = \frac{7}{20}$$

$$8. \quad \frac{5}{8} + \frac{1}{3} = \frac{23}{24}$$

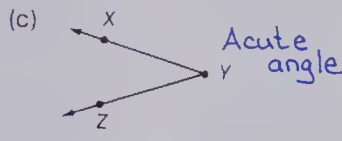
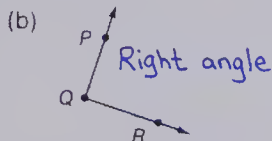
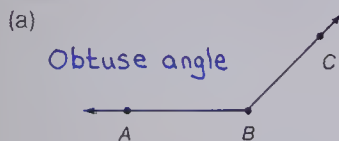
$$9. \quad 3\frac{1}{2} + 4\frac{1}{10} = 7\frac{6}{10} \text{ or } 7\frac{3}{5}$$

$$10. \quad 20 \times 90 = 1800$$

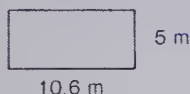
$$11. \quad 35 \times 100 = 3500$$

$$12. \quad 750 \div 100 = 7.5$$

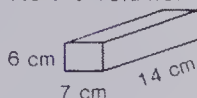
13. State whether each angle is acute, right, or obtuse.



14. Calculate the area.  $53\text{ m}^2$



15. Calculate the volume.  $588\text{ cm}^3$



16. Solve.

(a)  $37 - 15 = N$   $22$

(b)  $50 - N = 10$   $5$

(c)  $N + 12 = 58$   $46$

17. Find the greatest common factor for each pair of numbers.

(a) 8 and 14  $2$

(b) 16 and 20  $4$

(c) 6 and 24  $6$

18. Solve.

(a) What is the radius of a circle whose diameter is 10 cm?  $5\text{ cm}$

(b) A square has sides 15 cm long. What is the perimeter in centimetres of this square?  $60\text{ cm}$

Express each as a fraction out of 100 and then as a percent.

19.  $\frac{3}{5} = \frac{60}{100} = 60\%$  20.  $\frac{8}{10} = \frac{80}{100} = 80\%$  21.  $\frac{11}{20} = \frac{55}{100} = 55\%$  22.  $\frac{37}{50} = \frac{74}{100} = 74\%$

Find

23. 40% of 80  $32$  24. 10% of 30  $3$  25. 80% of \$50  $$40$  26. 20% of \$120  $$24$

Chapters 1-8: cumulative review 263

## OBJECTIVE

To review and test selected concepts and skills previously covered

## PACING

Level A All

Level B All

Level C All

## USING THE BOOK

This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a large number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic or, refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1, 2	21
3	79
4	94
5	139
6	233
7, 8	246-249
9	250
10	84
11	71
12	107
13	48
14	155
15	160
16	165
17	217
18(a)	42
18(b)	116
19-22	254
23-26	258, 259

# CHAPTER 9 OVERVIEW

This chapter begins with an extensive review of the four operations with whole numbers. Estimation skills are emphasized in computational exercises and then applied to problem solving. Procedures for short division are introduced using 1-digit divisors. Division of decimals by 1- and 2-digit divisors is also introduced. Number expressions requiring the use of order of operations are introduced and extended through both decoding and encoding exercises. Procedures for calculating averages are introduced through a sports theme. The chapter concludes with interpretation of circle graphs, investigation of pictographs and bar graphs, and construction of line graphs.

## OBJECTIVES

- A To estimate sums, differences, and products before calculation
- B To use short division to find 2- and 3-digit quotients
- C To divide a decimal by a 1-digit whole number
- D To divide a decimal by a 2-digit whole number
- E To solve number expressions using the order of operations
- F To find the average of a set of numbers
- G To construct a graph given the data in chart form
- H To solve word problems

## BACKGROUND

Many of the topics dealt with in this chapter are continuations of subjects previously introduced in this book. Average, which was briefly referred to on page 125, is here expressed as the sum of a group of numbers divided by the number of addends in that group. The children are asked to calculate the average for sets of numbers which contain from three to seven members.

The graphing lessons continue what was presented

in Chapter 6 and introduce circle graphs as a method of displaying information. Whereas on pages 176 to 181, and 186 children interpret and construct various graphs, here they are asked to discriminate between the various types, choosing one which best illustrates their data. Also, a 3-step technique for gathering and illustrating information is offered: (i) choose a subject (ii) collect and organize data (tally charts) (iii) construct an appropriate graph.

## MATERIALS

base-ten blocks (or cardboard representations —  
1 cm  $\times$  1 cm; 1 cm  $\times$  10 cm; 10 cm  $\times$  10 cm)  
graph paper

## CAREER AWARENESS

### Fishermen [269]

Fishing is not only a traditional way of life, but in some cases, it is the only source of income for towns and villages in the Maritime regions of Canada. Fishing skills are passed down from one generation to the next. Some fishermen remember stories of their ancestors and great sailing ships. Gasoline and diesel engines have replaced the sail as a means of propulsion.

Electronic navigation gear and more sophisticated weather forecasting have helped to lessen the dangers of fishing, but small and large boats are still subject to the whims of weather and must often face violent storms at sea.

Technical developments such as radios and other communications equipment have helped to increase the productivity of the fishing fleets. Smaller boats sometimes unload their catch on a mother ship. The fish are fast frozen on board and, when the holds are full, they are brought to port for immediate storage or distribution.



# Space Probes



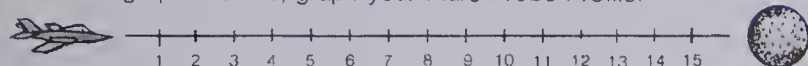
Be a Probe Pilot!

Where are you on the Probe Profiles?

## MARS PROBE

1. 24 +35 — 59	2. 0.72 +0.26 — 0.98	3. 408 +361 — 769	4. 52.30 +37.06 — 89.36	5. 7024 +1603 — 8627
6. 37 +56 — 93	7. 0.49 +1.73 — 2.22	8. 825 +409 — 1234	9. 7.04 +3.98 — 11.02	10. 4392 +4718 — 9110
11. 237.6 +687.9 — 925.5	12. 82 056 +39 286 — 121 342	13. \$525.89 + 768.54 — \$1294.43	14. 207 468 +384 908 — 592 376	15. 9263.77 +8371.55 — 17 635.32

On a graph like this, graph your Mars Probe Profile.

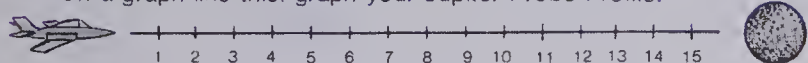


Probe Score

## JUPITER PROBE

1. 75 -30 — 45	2. 468 -237 — 231	3. 0.93 -0.51 — 0.42	4. 67.95 -53.04 — 14.91	5. 9758 -6023 — 3735
6. 60 -28 — 32	7. 3.05 -1.29 — 1.76	8. 800 -539 — 261	9. 9.04 -2.67 — 6.37	10. 7003 -5286 — 1717
11. \$73.24 - 36.86 — \$36.38	12. 81 052 -47 269 — 33 783	13. 63.47 -54.87 — 8.60	14. 351 641 -172 583 — 179 058	15. 435 170 - 76 281 — 358 889

On a graph like this, graph your Jupiter Probe Profile.



Probe Score

Practice: addition and subtraction 265

## OBJECTIVE

To review computational skills learned so far

## PACING

Level A All  
Level B All  
Level C All

## BACKGROUND

The Space Probes presented on pages 265 to 267 can be assigned in a variety of ways.

- Assign all four probes in sequence over a period of days as a comprehensive review.
- Assign each probe separately in order to review skills in one operation (e.g., Mars Probe — addition).
- Assign a row of five exercises on a regular basis to all students, or select a set which deals with a particular skill (or narrowly defined set of skills). See the charts in the Using the Book sections to assist with the identification of skills.
- Assign a row of exercises from a probe as extra practice for certain subsequent pages in this chapter (e.g., addition — page 268).

The method of assignment will depend largely on the particular use you intend to make of the exercises. Students' results can be used in a variety of ways.

- Evaluate the mastery level of each row. A score of 4 out of 5 (80%), or better, usually indicates mastery of a particular skill. A score of 3 out of 5 (60%), or less, may indicate a need for remediation.
- Evaluate the achievement level for a particular operation (e.g., subtraction — Jupiter Probe). A score of 11 (73%) or 12 (80%) out of 15 might be considered an acceptable level of achievement. This will vary, of course, depending on the particular standards that you have set for your class and the general achievement level of your students.

## USING THE BOOK

Students should check and correct their work for each assignment before going on to another. Have students graph their results by drawing and shading in the Probe Profile. Shade in those numbers which correspond to each correctly answered question. Unshaded portions indicate errors. The completed graphs provide you and each student with a permanent record and facilitate identification of those students who

require remediation.

The Galactic Star Rating chart can be used to record overall achievement with the four probes.

The skills represented by each set of exercises are listed.

### Mars Probe — Addition

Exercise	Topic	Page
1-5	2- to 4-digit addends, no regrouping	6, 7
6-10	2- to 4-digit addends, with regrouping	6, 7
11-15	4- to 6-digit addends, with regrouping	7, 21

### Jupiter Probe — Subtraction

Exercise	Topic	Page
1-5	2- to 4-digit, no regrouping	11, 12
6-10	2- to 4-digit, with regrouping (zero in the minuend)	11, 12
11-15	4- to 6-digit, with regrouping	21

## ACTIVITIES

1. There are several good activities described in the Activity Reservoir which test computation skills. If you have not already done so, see: "Quad-Row", "Batter Up", "Hopscotch", "Input-Output", "Slalom", and "Spider and the Fly".

2. As an alternative method of doing skill maintenance exercises, see the "Fact-Folder" idea described in the Activities teaching notes on page 152.

(continued on page 266)

OBJECTIVE

To review computational skills learned so far

PACING

- Level A All
- Level B All
- Level C All

BACKGROUND

See Background on page 265.

USING THE BOOK

Students should check and correct their work for each assignment before going on to another. Have students graph their results by drawing and shading in the Probe Profile. Shade in those numbers which correspond to each correctly answered question. Unshaded portions indicate errors. The completed graphs provide you and each student with a permanent record and facilitate identification of those students who require remediation.

The Galactic Star Rating chart can be used to record overall achievement with the four probes.

The skills represented are listed.

Saturn Probe — Multiplication

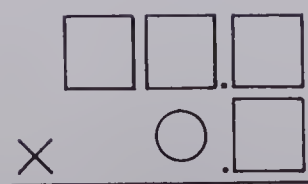
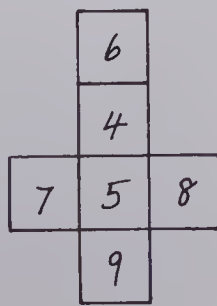
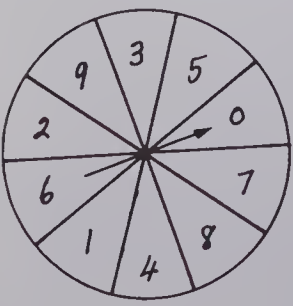
Exercise	Multiplier	Multiplicand	Page
1-5	multiples of 10	multiples of 10	71, 84
6-10	1-digit	2-, 3-digit	73, 74
11-15	1-digit	4-, 5-digit	75
16-20	2-digit	2-digit	85
21-25	2-digit	3-digit	86
26-30	decimal (tenths)	2-, 3-, 4-digit	93-95

ACTIVITIES

See the Activities on page 265.

(continued from page 265)

3. Use spinners, dice, and/or number cards to have students generate exercises of their own. Have the various digits placed into "blanks", if necessary, to keep the scope of the exercises familiar and reasonable.



SATURN PROBE

1.  $36 \times 10$   
360

2.  $100 \times 27$   
2700

3.  $100 \times 10$   
1000

4.  $400 \times 50$   
20000

5.  $300 \times 600$   
180000
6.  $40 \times 7$   
280

7.  $56 \times 8$   
448

8.  $\$4.07 \times 9$   
\\$36.63

9.  $720 \times 6$   
4320

10.  $358 \times 5$   
1790
11.  $3460 \times 7$   
24220

12.  $\$29.95 \times 6$   
\\$179.70

13.  $73\,024 \times 5$   
365120

14.  $61\,450 \times 7$   
430150

15.  $83\,177 \times 8$   
665416
16.  $47 \times 20$   
940

17.  $60 \times 37$   
2220

18.  $84 \times 65$   
5460

19.  $73 \times 44$   
3212

20.  $68 \times 56$   
3808
21.  $136 \times 40$   
5440

22.  $620 \times 39$   
24180

23.  $407 \times 34$   
13838

24.  $524 \times 65$   
34060

25.  $736 \times 72$   
52992
26.  $76 \times 0.8$   
60.8

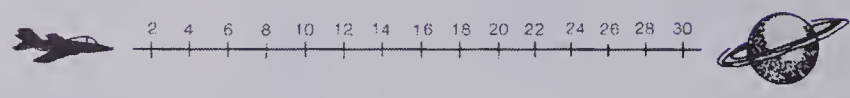
27.  $245 \times 0.3$   
73.5

28.  $2074 \times 0.6$   
1244.4

29.  $18.6 \times 0.9$   
16.74

30.  $4.38 \times 0.7$   
3.066

On a graph like this, graph your Saturn Probe Profile.



Probe Score

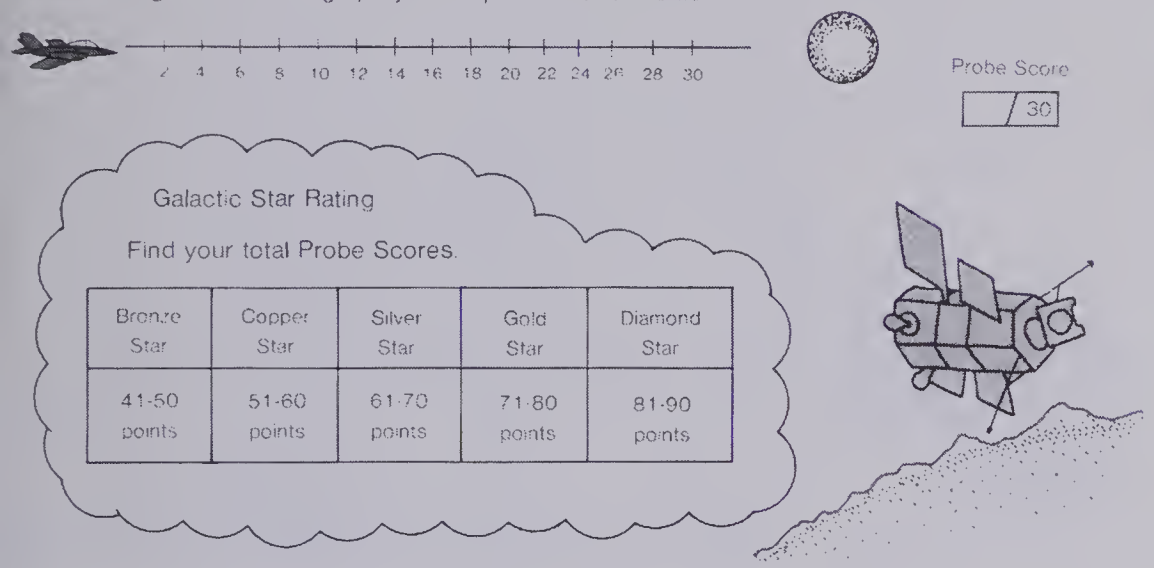
	/	30
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## NEPTUNE PROBE

Some have remainders!

1.  $7 \overline{)86}$   $12 R2$
2.  $6 \overline{)78}$   $13$
3.  $8 \overline{)349}$   $43 R5$
4.  $7 \overline{)252}$   $36$
5.  $5 \overline{)337}$   $67 R2$
6.  $4 \overline{)964}$   $241$
7.  $3 \overline{)952}$   $317 R1$
8.  $5 \overline{)675}$   $135$
9.  $6 \overline{)2172}$   $362$
10.  $7 \overline{)2977}$   $425 R2$
11.  $23 \overline{)161}$   $7$
12.  $41 \overline{)315}$   $7 R28$
13.  $15 \overline{)135}$   $9$
14.  $20 \overline{)160}$   $8$
15.  $32 \overline{)259}$   $8 R3$
16.  $24 \overline{)384}$   $16$
17.  $31 \overline{)817}$   $26 R11$
18.  $12 \overline{)444}$   $37$
19.  $40 \overline{)640}$   $16$
20.  $52 \overline{)975}$   $18 R39$
21.  $28 \overline{)980}$   $35$
22.  $24 \overline{)912}$   $38$
23.  $57 \overline{)2622}$   $46$
24.  $73 \overline{)2117}$   $29$
25.  $35 \overline{)2275}$   $65$
26.  $3 \overline{)1824}$   $608$
27.  $9 \overline{)3645}$   $405$
28.  $6 \overline{)4824}$   $804$
29.  $5 \overline{)2515}$   $503$
30.  $8 \overline{)5624}$   $703$

On a graph like this, graph your Neptune Probe Profile.



## OBJECTIVE

To review computational skills learned so far

## PACING

Level A All  
Level B All  
Level C All

## BACKGROUND

See Background on page 265.

## USING THE BOOK

Students should check and correct their work for each assignment before going on to another. Have students graph their results by drawing and shading in the Probe Profile. Shade in those numbers which correspond to each correctly answered question. Unshaded portions indicate errors. The completed graphs provide you and each student with a permanent record and facilitate identification of those students who require remediation.

The Galactic Star Rating chart can be used to record overall achievement with the four probes.

The skills represented are listed.

Neptune Probe — Division (some questions have remainders)

Exercise	Divisor	Quotient	Page
1-5	1-digit	2-digit	104, 105
6-10	1-digit	3-digit	106
11-15	2-digit	1-digit	136, 137
16-20	2-digit	2-digit	139, 141
21-25	2-digit	2-digit	141, 143
		(adjustment of estimate)	
26-30	1-digit	3-digit (with zero)	106, 143

## ACTIVITIES

See the Activities on pages 265 and 266.



## OBJECTIVE

To estimate sums and differences before calculation

## PACING

Level A 1-8, 11-18

Level B 3-10, 13-20

Level C 1-5, 11-15, 21-25

## SUGGESTIONS

**Initial Activity** If necessary, briefly review the skill of rounding numbers to the nearest 100 (see pages 27, 64, and 65). Use an example as in the pupil display to demonstrate how to estimate before attempting the written calculations. Remind students of the relationship between an *estimated* sum or difference and the actual sum or difference.

## USING THE BOOK

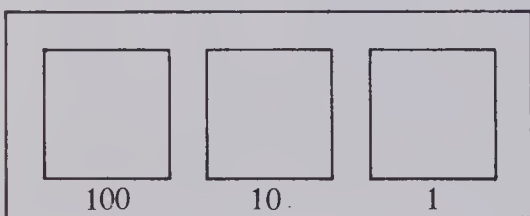
Remind students that the estimation process is to be done mentally. The estimated sum or difference should be recorded.

## ACTIVITIES

1. Some students might enjoy playing "Round Me" for two players.

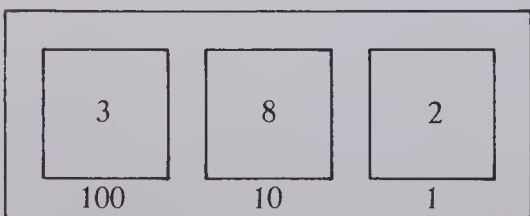
(a) Remove tens, jacks, queens, and kings from a deck of ordinary playing cards, leaving 36 cards. Aces count as 1 (one).

(b) Have students construct a simple game board as illustrated.



(c) Shuffle the deck and place the cards face down.

(d) The first player draws three cards, one at a time, and places them on the game board from left to right to create a 3-digit number.



(e) The first player rounds the number to the nearest hundred. The rounded number becomes the score for that player for the first round.

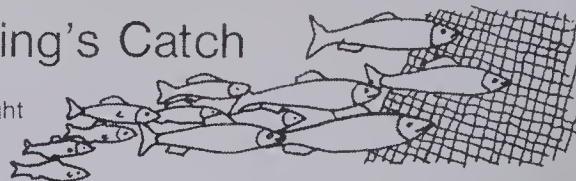
**Example**

382 → 400 (score)

(f) The game continues as above for the second player.

## Morning's Catch

Fishermen on the trawler "Debbie II" caught 583 cod and 237 salmon.



About how many fish altogether?

Estimate:	Calculate:
600	583
+200	+237
800	820

About how many more cod than salmon?

Estimate:	Calculate:
600	583
-200	-237
400	346

An estimate tells us whether or not our written answer is reasonable.

### Exercises

Record your estimate first, then calculate these catches.

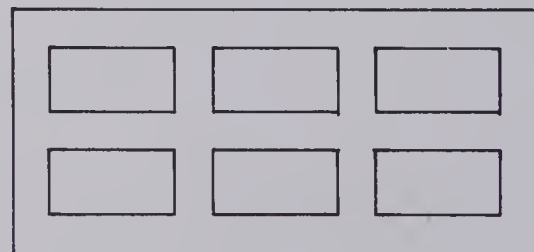
1. $\begin{array}{r} 871 \\ +240 \\ \hline 1111 \end{array}$	2. $\begin{array}{r} 121 \\ +485 \\ \hline 606 \end{array}$	3. $\begin{array}{r} 506 \\ +297 \\ \hline 803 \end{array}$	4. $\begin{array}{r} 350 \\ +280 \\ \hline 630 \end{array}$	5. $\begin{array}{r} 427 \\ +318 \\ \hline 745 \end{array}$
6. $\begin{array}{r} 918 \\ +358 \\ \hline 1276 \end{array}$	7. $\begin{array}{r} 480 \\ +280 \\ \hline 760 \end{array}$	8. $\begin{array}{r} 715 \\ +446 \\ \hline 1161 \end{array}$	9. $\begin{array}{r} 308 \\ +375 \\ \hline 683 \end{array}$	10. $\begin{array}{r} 635 \\ +486 \\ \hline 1121 \end{array}$
11. $\begin{array}{r} 619 \\ -273 \\ \hline 346 \end{array}$	12. $\begin{array}{r} 895 \\ -339 \\ \hline 556 \end{array}$	13. $\begin{array}{r} 703 \\ -517 \\ \hline 186 \end{array}$	14. $\begin{array}{r} 690 \\ -180 \\ \hline 510 \end{array}$	15. $\begin{array}{r} 548 \\ -273 \\ \hline 275 \end{array}$
16. $\begin{array}{r} 488 \\ -409 \\ \hline 79 \end{array}$	17. $\begin{array}{r} 550 \\ -207 \\ \hline 343 \end{array}$	18. $\begin{array}{r} 623 \\ -197 \\ \hline 426 \end{array}$	19. $\begin{array}{r} 792 \\ -356 \\ \hline 436 \end{array}$	20. $\begin{array}{r} 619 \\ -349 \\ \hline 270 \end{array}$
★ 21. $\begin{array}{r} 999 \\ +555 \\ \hline 1554 \end{array}$	★ 22. $\begin{array}{r} 4720 \\ +444 \\ \hline 5164 \end{array}$	★ 23. $\begin{array}{r} 1347 \\ -599 \\ \hline 748 \end{array}$	★ 24. $\begin{array}{r} 2222 \\ -999 \\ \hline 1223 \end{array}$	★ 25. $\begin{array}{r} 1010 \\ -101 \\ \hline 909 \end{array}$

268 Estimation addition and subtraction

(g) The winner is that player who has the greatest total score after five rounds.

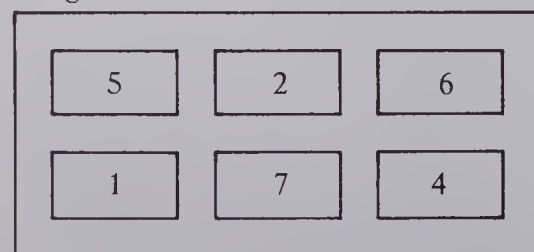
2. Use a similar format to play the game "Round and Go" for two players.

(a) Construct a simple game board as illustrated.



(b) Use the 36 cards as described above. Shuffle and place them face down.

(c) The first player draws 6 cards, one at a time, and places them from left to right across the three upper spaces; then across the three lower spaces of the game board.



(d) The player then rounds each number to the nearest hundred.

(i) If the upper number is greater than the lower number, the player must subtract.

(ii) If the upper number is smaller than the lower number, the player must add.

The sum or difference represents the player's score for that round.

**Example**

526	→	500	
174	→	-200	(score = 300)
		300	

(e) Play continues for the other player as described. The winner is that player with the greatest total score after three rounds of play.

**Variation:**

Encourage addition by making the rule: "Greatest total score wins."

Incorporate strategy into the game by permitting a player to place the cards anywhere on the game board.

**Example**

A player draws 7, 7, 1, 5, 3, and 4 and arranges the cards to make the greatest possible score.

751	→	800
+743	→	+700
		1500 (score = 1500)

## The Fishermen

The fishing boat *Albatross* has travelled 3895 km.  
The *Argosy* has travelled 6247 km.  
How many more kilometres has the *Argosy* travelled?

Estimate:  
6000  
-4000  
-----  
2000

Calculate:  
6247  
-3895  
-----  
2352

About 2000 km farther.

2352 km farther.

### Exercises

Estimate first, then calculate.

- The captain of the *Westwood* bought 385 m of rope to repair some nets.

Later, he bought 224 m of rope.

About how many metres of rope did he buy? <sup>600 m</sup> (Estimate.)

How many metres of rope did he buy? <sup>609 m</sup> (Calculate.)

- The fishing trawler *Easton* has sold \$5224 worth of fish.

The *Randolph* has sold \$7685 worth of fish.

<sup>\$3000</sup>

About how much more money has the *Randolph* made? (Estimate.)

How much more has the *Randolph* made? <sup>\$2461</sup> (Calculate.)

- The captain of the *Woburn II* spent \$479.35 to repair the engine and \$237.18 to repair the rudder.

<sup>\$700</sup>

About how much was the total cost of repairs? (Estimate.)

How much was the total cost of repairs? <sup>\$716.53</sup> (Calculate.)

- One fishing fleet caught 62 t of fish.

Another fleet caught 37 t.

About how many more tonnes were caught by the first fleet? <sup>20 t</sup> (Estimate.)

How many more tonnes were caught by the first fleet? <sup>25 t</sup> (Calculate.)

Estimation and problem solving addition and subtraction 269

## OBJECTIVE

To apply estimation of sums and differences to problem solving

## PACING

Level A All  
Level B All  
Level C All

## SUGGESTIONS

**Initial Activity** If necessary, review Professor Q's four questions (see page 4). Remind students that an estimate helps to tell us whether a calculated sum or difference is reasonable.

## USING THE BOOK

Using the problem in the pupil display, ask students how the two numbers were rounded (i.e., to the nearest thousand). Point out that the estimated difference can be calculated mentally because the rounding process has reduced the question to a basic subtraction fact.  
 $6000 - 4000 \longrightarrow 6 - 4$

## ACTIVITIES

- (a) Remove the tens, jacks, queens, and kings from a deck of ordinary playing cards. Aces count as 1 (one).  
(b) Draw boxes (or spaces) on the chalkboard to represent various place values.

--	--	--

Hundreds

--	--	--	--

Thousands

- (c) Have a student volunteer draw the appropriate number of cards from the deck and fill in the digits in order from left to right.

**Example**

Cards drawn: 6, 3, and 8.

6	3	8
---	---	---

- (d) Ask students to record the rounded

number (in this case, to the nearest hundred).

$638 \longrightarrow 600$

- (e) Include boxes (or spaces) that represent decimal places. In this case, include the directions to round to the nearest one.

--	--	--	--	--

2. Provide exercises similar to the following to reinforce rounding and estimation.

- (a) Round to the nearest thousand.

Number	Round to Nearest Thousand
(a) 4873	5000
(b) 8105	_____
(c) 7465	_____
(d) 3610	_____
(e) 6782	_____
(f) 2399	_____

- (b) Estimate the difference between:

- (i) (b) and (f),
- (ii) (a) and (d),
- (iii) (e) and (f).

- (c) Estimate the sum of:

- (i) (b) and (f),
- (ii) (c) and (d),
- (iii) (f) and (d),
- (iv) (a), (d), and (e).

3. If you haven't already done so, see the Activities listed on pages 64 and 65 of the teaching notes.



## OBJECTIVE

To estimate the product of 2-digit factors

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

HMS — DM66.

## BACKGROUND

As the size of factors increases, it becomes more difficult to judge whether the calculated product is reasonable in relation to the estimated product. One solution is to provide limits within which the calculated product must fall. For example, the factors in the pupil display ( $63 \times 27$ ) are rounded down and up to provide lower and upper limits (i.e., 1200 and 2100). The calculated product (1701) falls within the limits.

However, some students may find it easier to make a single estimate by using the regular rounding procedures.  $63 \times 27 \rightarrow 60 \times 30 = 1800$ . Given practice, many students will refine their estimate.

### Example

$27 \times 41 \rightarrow 30 \times 40 = 1200$

"I rounded up three ( $27 \rightarrow 30$ ) for the first factor, but only rounded down one ( $41 \rightarrow 40$ ) for the second factor; therefore, the actual product will be slightly less than 1200."

$27 \times 41 = 1107$

Whether you choose the "limits" approach or the "single" approach, the important point is that students be encouraged to make estimation a regular part of the arithmetic process.

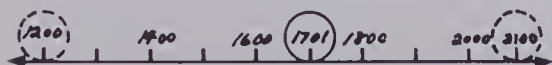
## SUGGESTIONS

**Initial Activity** If necessary, briefly review multiplication with 2-digit factors. Include factors which are multiples of ten as an oral exercise, e.g.,  $60 \times 30$ ,  $20 \times 80$ , and  $50 \times 70$ .

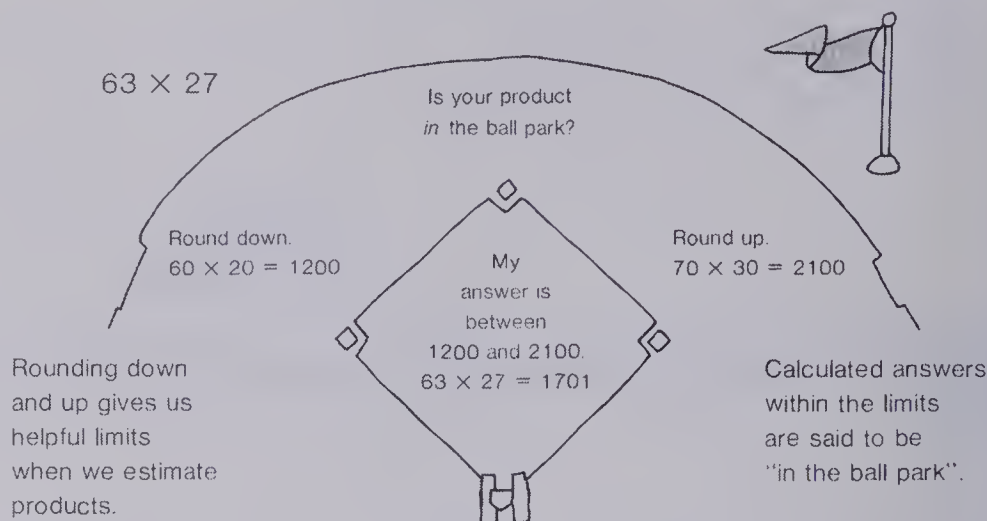
Use a diagram as in the pupil display to describe what is meant by "in the ball park". You might use an improvised number line on the chalkboard to demonstrate that the calculated product will fall somewhere between the two estimated limits.

### Example

$63 \times 27 = 1701$



## In the Ball Park



### Exercises

Round down and up for limits, then calculate.

Are your products in the ball park?

Down  $47 \times 32 = 1504$  Up  $50 \times 40 = 2000$  2. Down  $81 \times 75 = 6075$  Up  $80 \times 70 = 5600$  3. Down  $58 \times 67 = 3886$  Up  $60 \times 70 = 4200$

1.  $40 \times 30 = 1200$  2.  $80 \times 70 = 5600$  3.  $50 \times 60 = 3000$  4.  $60 \times 70 = 4200$

5.  $72 \times 46 = 3312$  6.  $66 \times 71 = 4686$  7.  $49 \times 36 = 1764$  8.  $92 \times 27 = 2484$  9.  $33 \times 22 = 726$  10.  $75 \times 55 = 4125$  11.  $84 \times 37 = 3108$  12.  $99 \times 25 = 2475$  13.  $55 \times 30 = 1650$  14.  $29 \times 29 = 841$  15.  $90 \times 90 = 8100$

270 Estimation, multiplication

## USING THE BOOK

Remind students that estimates are to be done mentally. You might suggest that they record the upper and lower limits for Exercises 1 to 3.

## ACTIVITIES

1. Provide exercises similar to the following to those students who may require extra practice.

### Limits Approach

1st Factor	2nd Factor	Upper Limit	Lower Limit	Actual Product
(a) 25	33	1200	600	825
(b) 48	22	?	?	?

### Single Approach

Factors	Estimate	Actual Product
(a) (25, 33)	900	825
(b) (48, 22)	?	?

2. Use the "guess and test" approach in activities similar to this one.

### Example

Estimate first, then select the most likely product.

$27 \times 39 = ?$  [(c) 1053]

(a) 1275	(b) 1579
(c) 1053	(d) 780

3. If you are using the single approach to rounding, consider using an exercise similar to this one for extra practice.

### Examples

Which is the best estimate?

(a)  $24 \times 38$  [ $20 \times 40 = 800$ ]

(i) 80 (ii) 800 (iii) 8000

(b)  $36 \times 47$  [ $40 \times 50 = 2000$ ]

(i) 20 (ii) 200 (iii) 2000 (iv) 20 000

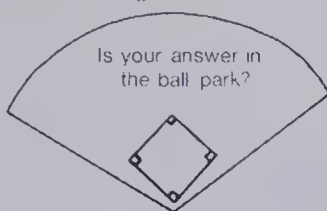


## The Ball Game

Baseball fans from Rockford were brought to the game in 7 buses.  
Each bus carried 46 passengers.  
How many fans from Rockford attended the game?

Estimate:

Round up  $7 \times 50 = 350$   
Round down  $7 \times 40 = 280$



Calculate:

46  
 $\times 7$   
322

Between 280 and 350 fans.

322 Rockford fans attended

### Exercises

Estimate first, then calculate.

- The ball park has 6 banks of lights for night games.  
There are 16 lights in each bank.  
*About how many lights altogether?* *Between 60 and 120.* (Estimate.)  
How many lights altogether? *96* (Calculate.)
- The electronic score board has 88 columns of lights across with 73 lights in each column.  
*About how many lights altogether?* (Estimate.) *Between 5600 and 7200.*  
How many lights altogether? *6424* (Calculate.)
- There are 7 popcorn machines in the ball park.  
Each machine prepares 165 boxes of popcorn before a game.  
*About how many boxes of popcorn are prepared?* *Between 700 and 1400.* (Estimate.)  
How many boxes of popcorn are prepared? *1155* (Calculate.)
- 85 boxes of potato chips were ordered.  
Each box contained 36 bags.  
*About how many bags of potato chips were ordered?* *Between 2400 and 3600.* (Estimate.)  
How many bags of potato chips were ordered? *3060* (Calculate.)
- On the average, 6830 people attend each game.  
*About how many people in total would attend 5 games?* *Between 30 000 and 35 000.* (Estimate.)  
How many people in total would attend 5 games? *34 150* (Calculate.)



## OBJECTIVE

To apply estimation of products to problem solving

## PACING

Level A All  
Level B All  
Level C All

## USING THE BOOK

Use the example in the pupil display to demonstrate how, through rounding, we can obtain upper and lower limits for an estimate.

If you used the single approach in the previous lesson as opposed to the limits approach, you may want to revise the example in the display.

### Example

$$7 \times 46 \rightarrow 7 \times 50 = 350$$

"Because I rounded up, there will be fewer than 350 fans at the ball game."

Whatever approach you decide to use, reinforce the idea that estimation is an important skill in problem solving. An estimate helps to tell us whether our solution is reasonable.

Estimation and problem solving: multiplication 271

## ACTIVITIES

- (a) Remove the tens, jacks, queens, and kings from a deck of ordinary playing cards. Aces count as 1 (one).  
(b) Ask a student to choose a favourite 2-, 3-, or 4-digit number, e.g., 365.  
(c) Ask another student to draw a card from the deck, e.g., 7.  
(d) Have the class estimate the limits within which the product will fall.  
 $7 \times 365 \rightarrow 7 \times 400 = 2800$   
 $\rightarrow 7 \times 300 = 2100$   
(If you are using the single approach to rounding, use just one estimate.)  
 $7 \times 365 \rightarrow 7 \times 400 = 2800$   
(e) If a calculator is available, have a student calculate the actual product.  
 $7 \times 365 = 2555$   
(f) Repeat with other favourite numbers.

2. Use the "guess and test" approach in activities similar to this one.

### Example

Estimate first, then select the likely product.

$$7 \times 34 = ? [(b) 238]$$

(a) 208	(b) 238
(c) 288	(d) 280

3. If you are using the single approach to rounding, you might use an exercise similar to this one for extra practice.

### Examples

Which is the best estimate?

(a)  $8 \times 38$  [ $8 \times 40 = 320$ ]

(i) 32 (ii) 320 (iii) 3200

(b)  $7 \times 6835$  [ $7 \times 7000 = 49\ 000$ ]

(i) 490 (ii) 4900 (iii) 49 000

(iv) 490 000

## OBJECTIVE

To use the short division form with a 1-digit divisor and 2-digit quotient

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

base-10 blocks (or cardboard representations)

□ (1 cm by 1 cm) represents one  
▬ (1 cm by 10 cm) represents ten

## BACKGROUND

The use of base-10 blocks (or equivalent materials) provides the opportunity to review the meaning of division; to review, with understanding, the operation of the division algorithm; and to compare the standard algorithm to "short" division.

## SUGGESTIONS

**Initial Activity** Provide students with concrete materials as suggested in the Materials section. Work through a number of examples stressing the relationship between the manipulation of the materials and the operation of the algorithms.

*Example*

$$4 \overline{)68}$$

## Mental Magic

Lee uses long division.

Step 1  $4 \overline{)68}$

$$\begin{array}{r} 1 \\ 4 \overline{)68} \\ \underline{4} \phantom{0} \\ 28 \phantom{0} \end{array}$$

Step 2  $4 \overline{)68}$

$$\begin{array}{r} 17 \\ 4 \overline{)68} \\ \underline{4} \phantom{0} \\ 28 \phantom{0} \\ \underline{28} \\ 0 \end{array}$$

20 is represented by



Sara uses short division.

$$\begin{array}{r} 1 \\ 4 \overline{)68} \\ \underline{4} \phantom{0} \\ 28 \phantom{0} \end{array}$$

Think: 7

$$4 \overline{)28}$$

Mental work can make division easier!

### Exercises

Complete these long and short division examples.

$$\begin{array}{r} 14 \\ 5 \overline{)70} \\ \underline{5} \phantom{0} \\ 20 \phantom{0} \\ \underline{20} \\ 0 \end{array}$$

$$\begin{array}{r} 14 \\ 5 \overline{)70} \\ \underline{5} \phantom{0} \\ 20 \phantom{0} \\ \underline{20} \\ 0 \end{array}$$

$$\begin{array}{r} 25 \\ 7 \overline{)175} \\ \underline{14} \phantom{0} \\ 35 \phantom{0} \\ \underline{35} \\ 0 \end{array}$$

$$\begin{array}{r} 25 \\ 7 \overline{)175} \\ \underline{14} \phantom{0} \\ 35 \phantom{0} \\ \underline{35} \\ 0 \end{array}$$

Divide. Use short division.

$$6 \overline{)72} \quad 12$$

$$4 \overline{)124} \quad 31$$

$$3 \overline{)78} \quad 26$$

$$9 \overline{)135} \quad 15$$

$$7 \overline{)126} \quad 18$$

$$8 \overline{)96} \quad 12$$

$$4 \overline{)52} \quad 13$$

$$7 \overline{)224} \quad 32$$

$$5 \overline{)200} \quad 40$$

$$2 \overline{)166} \quad 83$$

$$3 \overline{)81} \quad 27$$

$$8 \overline{)504} \quad 63$$

$$9 \overline{)630} \quad 70$$

$$4 \overline{)380} \quad 95$$

$$7 \overline{)91} \quad 13$$

$$3 \overline{)105} \quad 35$$


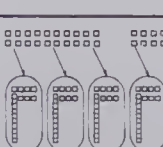
$$8 \overline{)216} \quad 27$$

$$9 \overline{)324} \quad 36$$

$$2 \overline{)76} \quad 38$$

$$6 \overline{)522} \quad 87$$

272 Short division: 2-digit quotient

Standard Form	Concrete Materials	Short Division
(a) $4 \overline{)68}$	We want to share 68 equally among 4 sets.  1 ten in each set with 28 left over.	$4 \overline{)68}$
(b) $4 \overline{)68}$	 7 ones in each set. There are 1 ten and 7 ones (or 17) in each of 4 sets.	$4 \overline{)68}$

As you highlight the short-division form, ask students to explain what the "helper number" represents and how it assists in the division process. As you demonstrate with other examples, stress the importance of working neatly.

## USING THE BOOK

Assign Exercise 1 then check the students' work. Repeat with Exercise 2.

Some students might benefit from using the long form for each of Exercises 3 to 6, then writing the matching short form. More able

students might be encouraged to use the short form without the "helper" numbers.

## ACTIVITIES

1. Errors may occur because of difficulties with basic facts. Incorporate basic multiplication and subtraction facts as part of your on-going drill program.

2. See the "Fact Folder" idea for practising computations in the Activities section, page 152, of the teaching notes.

## More Mental Magic

Long Division

$$\begin{array}{r} 127 \\ 5 \overline{) 639} \\ \underline{5} \phantom{00} \\ 13 \phantom{00} \\ \underline{10} \phantom{00} \\ 39 \phantom{00} \\ \underline{35} \phantom{00} \\ 4 \end{array}$$

Remainder 4  
Divisor 5

Short Division

$$\begin{array}{r} 127 \\ 5 \overline{) 639} \\ \underline{5} \phantom{00} \\ 13 \phantom{00} \\ \underline{10} \phantom{00} \\ 39 \phantom{00} \\ \underline{35} \phantom{00} \\ 4 \end{array}$$

Remainder 4  
Divisor 5

100 is represented by 1

30 is represented by 3

Sometimes the remainder is expressed as a fraction.

### Exercises

Complete these long and short division examples.

$$\begin{array}{r} 127 \\ 3 \overline{) 527} \\ \underline{3} \phantom{00} \\ 22 \phantom{00} \\ \underline{21} \phantom{00} \\ 17 \phantom{00} \\ \underline{15} \phantom{00} \\ 2 \end{array}$$

1.  $3 \overline{) 527}$  R 2

$$\begin{array}{r} 127 \\ 3 \overline{) 527} \\ \underline{3} \phantom{00} \\ 22 \phantom{00} \\ \underline{21} \phantom{00} \\ 17 \phantom{00} \\ \underline{15} \phantom{00} \\ 2 \end{array}$$

2.  $6 \overline{) 1422}$  R 4

$$\begin{array}{r} 127 \\ 6 \overline{) 1422} \\ \underline{12} \phantom{00} \\ 22 \phantom{00} \\ \underline{18} \phantom{00} \\ 42 \phantom{00} \\ \underline{42} \phantom{00} \\ 0 \end{array}$$

$$\begin{array}{r} 127 \\ 6 \overline{) 1422} \\ \underline{12} \phantom{00} \\ 22 \phantom{00} \\ \underline{18} \phantom{00} \\ 42 \phantom{00} \\ \underline{42} \phantom{00} \\ 0 \end{array}$$

Divide using short division. Some have remainders.

$$\begin{array}{r} 127 \\ 4 \overline{) 504} \\ \underline{116} \phantom{00} \\ 116 \phantom{00} \\ \underline{116} \phantom{00} \\ 0 \end{array}$$

3.  $4 \overline{) 504}$  R 1

$$\begin{array}{r} 127 \\ 6 \overline{) 1662} \\ \underline{137} \phantom{00} \\ 292 \phantom{00} \\ \underline{252} \phantom{00} \\ 40 \end{array}$$

4.  $6 \overline{) 1662}$  R 2

$$\begin{array}{r} 127 \\ 7 \overline{) 942} \\ \underline{217} \phantom{00} \\ 725 \phantom{00} \\ \underline{700} \phantom{00} \\ 25 \end{array}$$

5.  $7 \overline{) 942}$  R 4

$$\begin{array}{r} 127 \\ 3 \overline{) 453} \\ \underline{151} \phantom{00} \\ 302 \phantom{00} \\ \underline{302} \phantom{00} \\ 0 \end{array}$$

6.  $3 \overline{) 453}$  R 1

$$\begin{array}{r} 127 \\ 8 \overline{) 929} \\ \underline{532} \phantom{00} \\ 397 \phantom{00} \\ \underline{384} \phantom{00} \\ 13 \end{array}$$

7.  $8 \overline{) 929}$  R 2

$$\begin{array}{r} 127 \\ 5 \overline{) 685} \\ \underline{252} \phantom{00} \\ 433 \phantom{00} \\ \underline{425} \phantom{00} \\ 8 \end{array}$$

8.  $5 \overline{) 685}$  R 2

$$\begin{array}{r} 127 \\ 3 \overline{) 651} \\ \underline{147} \phantom{00} \\ 504 \phantom{00} \\ \underline{504} \phantom{00} \\ 0 \end{array}$$

9.  $3 \overline{) 651}$  R 1

$$\begin{array}{r} 127 \\ 2 \overline{) 886} \\ \underline{261} \phantom{00} \\ 354 \phantom{00} \\ \underline{354} \phantom{00} \\ 0 \end{array}$$

10.  $2 \overline{) 886}$  R 1

$$\begin{array}{r} 127 \\ 4 \overline{) 2130} \\ \underline{172} \phantom{00} \\ 410 \phantom{00} \\ \underline{408} \phantom{00} \\ 2 \end{array}$$

11.  $4 \overline{) 2130}$  R 2

$$\begin{array}{r} 127 \\ 9 \overline{) 2268} \\ \underline{203} \phantom{00} \\ 238 \phantom{00} \\ \underline{234} \phantom{00} \\ 4 \end{array}$$

12.  $9 \overline{) 2268}$  R 2

$$\begin{array}{r} 127 \\ 7 \overline{) 1030} \\ \underline{147} \phantom{00} \\ 883 \phantom{00} \\ \underline{889} \phantom{00} \\ -6 \end{array}$$

13.  $7 \overline{) 1030}$  R 1

$$\begin{array}{r} 127 \\ 5 \overline{) 1305} \\ \underline{101} \phantom{00} \\ 295 \phantom{00} \\ \underline{295} \phantom{00} \\ 0 \end{array}$$

14.  $5 \overline{) 1305}$  R 1

Divide. Express remainders as fractions.

$$\begin{array}{r} 127 \\ 6 \overline{) 849} \\ \underline{141} \phantom{00} \\ 708 \phantom{00} \\ \underline{708} \phantom{00} \\ 0 \end{array}$$

15.  $6 \overline{) 849}$  R  $\frac{1}{2}$

$$\begin{array}{r} 127 \\ 4 \overline{) 812} \\ \underline{203} \phantom{00} \\ 609 \phantom{00} \\ \underline{608} \phantom{00} \\ 1 \end{array}$$

16.  $4 \overline{) 812}$  R  $\frac{1}{4}$

$$\begin{array}{r} 127 \\ 8 \overline{) 4845} \\ \underline{605} \phantom{00} \\ 635 \phantom{00} \\ \underline{632} \phantom{00} \\ 3 \end{array}$$

17.  $8 \overline{) 4845}$  R  $\frac{5}{8}$

$$\begin{array}{r} 127 \\ 5 \overline{) 505} \\ \underline{101} \phantom{00} \\ 404 \phantom{00} \\ \underline{405} \phantom{00} \\ -1 \end{array}$$

18.  $5 \overline{) 505}$  R  $\frac{1}{5}$

Short division. 3-digit quotient 273

## OBJECTIVE

To use the short-division form with a 1-digit divisor and 3-digit quotient

## PACING

Level A 1-15  
Level B 1-13, 16  
Level C 1-12, 16-18

## RELATED AIDS

HMS — DM67.  
BFA PROB. SOLVING LAB II — 74.

## USING THE BOOK

Use the example in the pupil display to demonstrate short division with a 3-digit quotient. Ask students to explain how the small digits 1 and 3 are used on the right of the display to represent numerals in the short form.

Also demonstrate how the remainder is placed over the divisor to create a fractional remainder.

Assign Exercises 1 and 2 as a whole class activity. Then assign the remainder of the exercises as suggested in the Pacing section.

## ACTIVITIES

1. Some students might enjoy working on this number activity.

(a) Choose any prime number greater than 3.

(b) Multiply the number by itself, e.g.,  $13 \times 13 = 169$ .

(c) Divide this number by 6 using short division. What is the remainder?

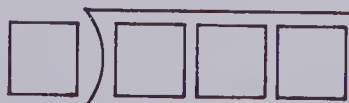
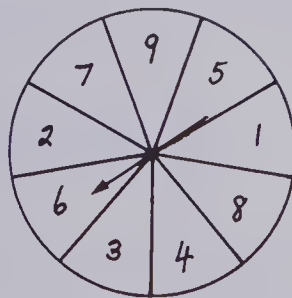
28 R1

$$\begin{array}{r} 127 \\ 6 \overline{) 169} \end{array}$$

(d) Try other prime numbers greater than 3, but less than 100. What is the remainder each time? [one]

(e) Try prime numbers greater than 100.

2. Provide the students with a spinner as shown. Have them (in groups of two to four) take turns twirling the spinner five times and placing each digit in a blank space on a division sheet. After making their own division questions, players compute the result, scoring an amount equal to the remainder. The player with the greatest total score after three rounds wins.



Example

Twirl: 6, 1, 7, 4, and 8

291 R2

Write:  $6 \overline{) 1748}$

Score: 2

3. To review and maintain rounding skills, see the Activities on pages 27 to 29, and 65 in the teaching notes.



## OBJECTIVE

To divide a decimal by a 1-digit whole number resulting in a 1- or 2-digit quotient

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

base-10 blocks, or homemade cardboard squares and strips constructed so that:



represents  $\frac{10}{10}$  or one

(10 cm by 10 cm)

and

represents  $\frac{1}{10}$  or 0.1

(1 cm by 10 cm).

## RELATED AIDS

BFA PROB. SOLVING LAB II—138.

## BACKGROUND

The skills required for division of decimals are essentially the same as those required for division of whole numbers. In both cases, the algorithm is operating upon a common numeration system—base ten.

Division of decimals, however, requires a refined sense of place value and an understanding of how decimals can be grouped in equivalent sets. Understanding of the division process with decimals (as with whole numbers) should be developed through exposure to and manipulation of concrete models.

## SUGGESTIONS

**Initial Activity** Provide groups of students with sets of cardboard models as listed in the Materials section.

Work through the following division problems and stress the “sharing” (or partitive) aspect of division.

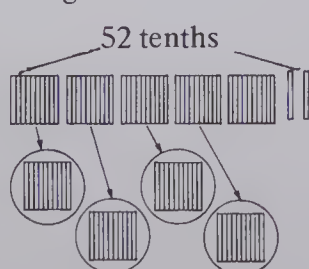
*Example 1*

$$4 \overline{) 5.2}$$

We want to share 5.2 (i.e., five and two tenths) equally among 4 sets.

(a)

$$\begin{array}{r} 1 \\ 4 \overline{) 5.2} \\ \underline{4} \phantom{0} \\ 12 \phantom{0} \end{array}$$



One (or 10 tenths) for each of 4 sets with 12 tenths left over.

## String Art

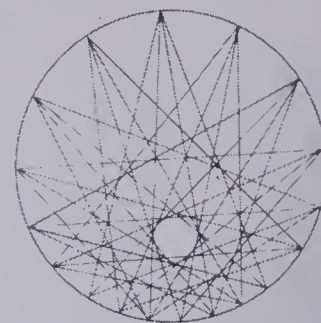
Richard and Theresa make interesting designs with string art! They used 3.2 m of green string. Theresa cut it into 4 equal pieces. How long is each piece?

$$\begin{array}{r} 0.8 \\ 4 \overline{) 3.2} \\ \underline{32} \phantom{0} \\ 0 \phantom{0} \end{array}$$

Check

$$\begin{array}{r} 0.8 \\ \times 4 \\ \hline 3.2 \end{array}$$

Each piece is 0.8 m long.



### Exercises

Divide. Check by multiplication.

$$\begin{array}{r} 0.7 \\ 5 \overline{) 3.5} \\ \underline{35} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 0.8 \\ 6 \overline{) 4.8} \\ \underline{48} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 0.4 \\ 4 \overline{) 1.6} \\ \underline{16} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 0.9 \\ 4 \overline{) 3.6} \\ \underline{36} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 0.7 \\ 5 \overline{) 4.2} \\ \underline{42} \phantom{0} \\ 0 \phantom{0} \end{array}$$

Divide. Check by multiplication.

$$\begin{array}{r} 1.8 \\ 4 \overline{) 7.2} \\ \underline{72} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 2.8 \\ 3 \overline{) 8.4} \\ \underline{84} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 2.3 \\ 5 \overline{) 11.5} \\ \underline{115} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 2.3 \\ 7 \overline{) 16.1} \\ \underline{161} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 2.6 \\ 4 \overline{) 10.4} \\ \underline{104} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 2.6 \\ 3 \overline{) 7.8} \\ \underline{78} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 1.5 \\ 6 \overline{) 9.0} \\ \underline{90} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 3.6 \\ 9 \overline{) 32.4} \\ \underline{324} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 2.6 \\ 4 \overline{) 10.4} \\ \underline{104} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 1.9 \\ 6 \overline{) 11.4} \\ \underline{114} \phantom{0} \\ 0 \phantom{0} \end{array}$$

Solve.

Wall String Designs

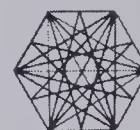
23. The board for this design is square. Perimeter is 5.2 m. How long is each side?

1.3 m



24. 6-sided design. Perimeter is 4.8 m. How long is each side?

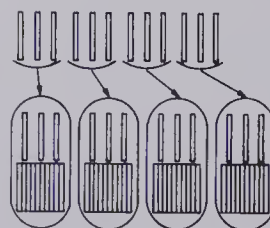
0.8 m



274 Division of decimals: 1-digit divisor: 1- and 2-digit quotients.

$$\begin{array}{r} 1.3 \\ 4 \overline{) 5.2} \\ \underline{4} \phantom{0} \\ 12 \phantom{0} \\ \underline{12} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$\frac{3}{10}$  for each set.



There are 13 tenths (or  $1\frac{3}{10}$  or 1.3) in each of 4 sets.

## USING THE BOOK

Some students may wish to continue using the standard algorithm for these exercises. If so, they should be excused from checking each exercise by multiplication. Those students using short division should check at least every other exercise.

Encourage students to judge the reasonableness of a quotient by estimating.

*Examples*

$$\begin{array}{r} 0.7 \\ 5 \overline{) 3.5} \\ \underline{35} \phantom{0} \\ 0 \phantom{0} \end{array}$$

3.5 is less than 5, so the quotient will

be less than one (1). Most students should be quick to see the related fact here also:

$$\begin{array}{r} 7 \\ 5 \overline{) 35} \end{array} \longrightarrow \begin{array}{r} 0.7 \\ 5 \overline{) 3.5} \end{array}$$

$$\begin{array}{r} 1.8 \\ 4 \overline{) 7.2} \end{array}$$

7.2 is slightly less than 8 and  $4 \times 2$  is 8, so the quotient will be slightly less than 2.

## ACTIVITIES

1. Play “Concentration” as described in the Activity Reservoir. Use matching cards such as:

$$\begin{array}{r} 0.8 \\ 4 \overline{) 3.2} \end{array} \longleftrightarrow \begin{array}{r} 0.8 \\ \times 4 \\ \hline 3.2 \end{array}$$

$$\begin{array}{r} 0.9 \\ 3 \overline{) 2.7} \end{array} \longleftrightarrow \begin{array}{r} 0.9 \\ \times 3 \\ \hline 2.7 \end{array}$$

2. See “Hopscotch” as described in the Activity Reservoir.

## Rainy Recess Games

Brent's Grade 5 class collected money to buy "Rainy Recess" games. They collected \$63.84. They bought 8 different games each for the same price. How much did they pay for each game?

$$\begin{array}{r} 7.98 \\ 8 \overline{) 63.84} \end{array}$$

Check

$$\begin{array}{r} 7.98 \\ \times 8 \\ \hline 63.84 \end{array}$$

The price of each game is \$7.98.



### Exercises

Divide.

$$\begin{array}{r} 3.27 \\ 4 \overline{) 13.08} \end{array}$$

$$\begin{array}{r} 1.95 \\ 7 \overline{) 13.65} \end{array}$$

$$\begin{array}{r} 4.26 \\ 6 \overline{) 25.56} \end{array}$$

$$\begin{array}{r} 4.17 \\ 3 \overline{) 12.51} \end{array}$$

$$\begin{array}{r} 3.24 \\ 8 \overline{) 25.92} \end{array}$$

$$\begin{array}{r} 3.18 \\ 4 \overline{) 12.72} \end{array}$$

$$\begin{array}{r} 4.29 \\ 3 \overline{) 12.87} \end{array}$$

$$\begin{array}{r} 2.41 \\ 9 \overline{) 21.69} \end{array}$$

$$\begin{array}{r} 5.29 \\ 2 \overline{) 10.58} \end{array}$$

$$\begin{array}{r} 3.58 \\ 5 \overline{) 17.90} \end{array}$$

$$\begin{array}{r} 4.42 \\ 6 \overline{) 26.52} \end{array}$$

$$\begin{array}{r} 5.03 \\ 4 \overline{) 20.12} \end{array}$$

$$\begin{array}{r} 1.98 \\ 7 \overline{) 13.86} \end{array}$$

$$\begin{array}{r} 1.53 \\ 9 \overline{) 13.77} \end{array}$$

$$\begin{array}{r} 6.18 \\ 3 \overline{) 18.54} \end{array}$$

$$\begin{array}{r} 3.09 \\ 8 \overline{) 24.72} \end{array}$$

Solve.

17. 3 chess games.  
\$14.85 altogether.  
How much for each game?



\$4.95

18. 5 boxes of checker men.  
\$8.95 altogether.  
How much for each box?



\$1.79

Write each quotient to complete the patterns. What rule helps you place the decimal point?

$$\begin{array}{r} 26 \\ 3 \overline{) 78} \end{array}$$

$$\begin{array}{r} ? \\ 3 \overline{) 7.8} \end{array}$$

$$\begin{array}{r} 147 \\ 4 \overline{) 588} \end{array}$$

$$\begin{array}{r} ? \\ 4 \overline{) 58.8} \end{array}$$

$$\begin{array}{r} ? \\ 4 \overline{) 5.88} \end{array}$$

$$\begin{array}{r} 427 \\ 6 \overline{) 2562} \end{array}$$

$$\begin{array}{r} ? \\ 6 \overline{) 256.2} \end{array}$$

$$\begin{array}{r} 4?27 \\ 6 \overline{) 25.62} \end{array}$$

$$\begin{array}{r} 0?427 \\ 6 \overline{) 2.562} \end{array}$$

$$\begin{array}{r} 2?12 \\ 5 \overline{) 1060} \end{array}$$

$$\begin{array}{r} 2?12 \\ 5 \overline{) 106.0} \end{array}$$

$$\begin{array}{r} 2?12 \\ 5 \overline{) 10.60} \end{array}$$

$$\begin{array}{r} 0?212 \\ 5 \overline{) 1.060} \end{array}$$

Keep decimal points aligned

Division of decimals: 1-digit divisor, 3-digit quotient with zero 275

## OBJECTIVE

To divide a decimal by a 1-digit whole number resulting in a 3-digit quotient

## PACING

Level A 1-20  
Level B 1-20  
Level C 5-22

## RELATED AIDS

HMS — DM68.

## SUGGESTIONS

**Initial Activity** Use the example in the pupil display to reinforce short division and placement of the decimal. Have students explain why multiplication can be used to check division.

Encourage students to see the value of general estimation to check the reasonableness of a quotient.

*Example*

$$\begin{array}{r} 7.98 \\ 8 \overline{) 63.84} \end{array}$$
  
"63.84 is slightly less than 64, and  $8 \times 8 = 64$ ; so the quotient will be slightly less than 8."

Reinforce estimation and placement of the decimal by using patterns similar to Exercises 19 to 22.

*Example*

$$\begin{array}{r} 23 \\ 4 \overline{) 92} \end{array} \rightarrow \begin{array}{r} 2.3 \\ 4 \overline{) 9.2} \end{array} \rightarrow \begin{array}{r} 0.23 \\ 4 \overline{) 0.92} \end{array}$$

## USING THE BOOK

Some students may still wish to use the long form of the algorithm rather than short division. Encourage other students to use short division. You might suggest that every third or fourth exercise be checked by multiplication.

Students should be made aware that Exercises 19 to 22 require no calculation. The quotients can be determined by the initial quotient. The decimal point in the quotient is placed directly above the decimal point in the dividend.

## ACTIVITIES

1. To reinforce the relatedness of division and multiplication, provide the students with several multiplication exercises which show products. Have them construct and complete the related division questions.

*Examples*

$$\begin{array}{r} 6.50 \\ \times 7 \\ \hline 45.50 \end{array} \rightarrow \begin{array}{r} 6.50 \\ 7 \overline{) 45.50} \\ \underline{42} \phantom{00} \\ 35 \phantom{00} \\ \underline{35} \phantom{00} \\ 00 \phantom{00} \\ \underline{0} \phantom{00} \\ 0 \end{array}$$

$$\begin{array}{r} 5.99 \\ \times 6 \\ \hline 35.94 \end{array} \rightarrow \begin{array}{r} 5.99 \\ 6 \overline{) 35.94} \\ \underline{30} \phantom{00} \\ 59 \phantom{00} \\ \underline{54} \phantom{00} \\ 54 \phantom{00} \\ \underline{54} \phantom{00} \\ 0 \end{array}$$

2. Play "Triple Concentration". Basic "Concentration" rules can be found in the Activity Reservoir. "Triple Concentration" simply has three cards per set. Use sets such as:

$$\begin{array}{r} 26 \\ 3 \overline{) 78} \end{array}$$

$$\begin{array}{r} 2.6 \\ 3 \overline{) 7.8} \end{array}$$

$$\begin{array}{r} 0.26 \\ 3 \overline{) 0.78} \end{array}$$

3. See "Quad-Row" as described in the Activity Reservoir.



## OBJECTIVE

To divide a decimal by a 2-digit whole number resulting in a 1- or 2-digit quotient

## PACING

Level A 1-8, 14-24, 28, 29

Level B 5-12, 20-29

Level C 6-22, 28, 29

## VOCABULARY

irrigation pipes, sprinkler, overflow

## RELATED AIDS

CALC. W/BK — 53.

## SUGGESTIONS

**Initial Activity** If necessary, review division of whole numbers by 2-digit divisors.

*Example*

$$\begin{array}{r} 36 \\ 24 \overline{)864} \\ \underline{72} \phantom{0} \\ 88 \\ \underline{88} \phantom{0} \\ 0 \end{array}$$

Have students explain each step of the algorithm and describe the estimation procedures used. Relate this review to the example in the display. Have students recall the rule developed in Exercises 19 to 22 on page 275 for placement of the decimal point.

## USING THE BOOK

Have students use multiplication periodically to check the exercises. The answers for Exercises 1 to 3, and 14 and 15 are in the back of the student text for those who wish to check their progress.

## ACTIVITIES

1. Supply students with division examples such as:

$$\begin{array}{r} 37 \\ 66 \overline{)2442} \longrightarrow ? \end{array}$$

Have them write two "it follows" division questions such as:

$$\begin{array}{r} 3.7 \\ 66 \overline{)244.2} \end{array} \text{ and } \begin{array}{r} 0.37 \\ 66 \overline{)24.42} \end{array}$$

Use the exercises on pages 139 and 141 to 143 as a source for questions.

2. Have students write two mini-problems of the style shown in Exercises 28 and 29. Have them use two correctly completed exercises from the page as a source. Allow them to write each problem on a card and exchange with a classmate.

3. To review basic division facts,

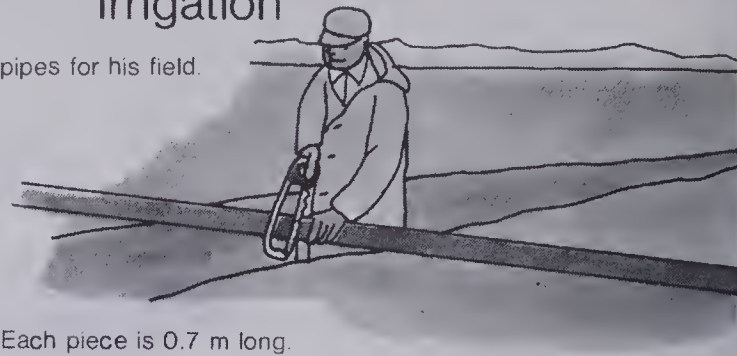
## Irrigation

Mr. Jackson is cutting irrigation pipes for his field.  
16.8 m of irrigation pipe.  
He cut it into 24 equal pieces.  
How long is each piece?

$$\begin{array}{r} 0.7 \\ 24 \overline{)16.8} \\ \underline{168} \phantom{0} \\ 0 \end{array}$$

Check.  
 $24 \times 0.7 = 16.8$

Each piece is 0.7 m long.



### Exercises

Divide.

$$\begin{array}{r} 0.5 \\ 31 \overline{)15.5} \\ \underline{155} \phantom{0} \\ 0 \end{array}$$

$$\begin{array}{r} 0.8 \\ 23 \overline{)18.4} \\ \underline{184} \phantom{0} \\ 0 \end{array}$$

$$\begin{array}{r} 0.6 \\ 45 \overline{)27.0} \\ \underline{270} \phantom{0} \\ 0 \end{array}$$

$$\begin{array}{r} 0.6 \\ 26 \overline{)15.6} \\ \underline{156} \phantom{0} \\ 0 \end{array}$$

Divide.

$$\begin{array}{r} 3.4 \\ 22 \overline{)74.8} \\ \underline{66} \phantom{0} \\ 88 \\ \underline{88} \phantom{0} \\ 0 \end{array}$$

Check.  
 $22 \times 3.4 = 74.8$

$$\begin{array}{r} 2.3 \\ 35 \overline{)80.5} \\ \underline{70} \phantom{0} \\ 105 \\ \underline{105} \phantom{0} \\ 0 \end{array}$$

$$\begin{array}{r} 3.6 \\ 41 \overline{)147.6} \\ \underline{125} \phantom{0} \\ 226 \\ \underline{226} \phantom{0} \\ 0 \end{array}$$

$$\begin{array}{r} 3.1 \\ 27 \overline{)83.7} \\ \underline{81} \phantom{0} \\ 270 \\ \underline{270} \phantom{0} \\ 0 \end{array}$$

Solve.

28. Sprinkler Pipes.  
28.0 m of pipe.  
It is cut into 35 equal pieces.  
How long is each piece? **0.8 m**

29. Overflow Pipes.  
43.2 m of pipe.  
It is cut into 27 equal pieces.  
How long is each piece? **1.6 m**

the students might enjoy a replay of "Motocross" as illustrated on pages 148 and 149 of the student's text.



## T-Shirts

27 students in the Camera Club bought T-Shirts.

Total cost was \$93.15.

What was the cost of each T-Shirt?

$$\begin{array}{r} 3.45 \\ 27 \overline{) 93.15} \\ \underline{81} \phantom{00} \\ 121 \phantom{00} \\ \underline{108} \phantom{00} \\ 135 \phantom{00} \\ \underline{135} \phantom{00} \\ 0 \end{array}$$



The cost of each T-Shirt was \$3.45.

### Exercises

- Divide.
- |                             |                             |                             |                             |                             |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| 1. $32 \overline{) 63.36}$  | 2. $25 \overline{) 53.75}$  | 3. $19 \overline{) 46.17}$  | 4. $21 \overline{) 66.15}$  | 5. $41 \overline{) 52.89}$  |
| 6. $34 \overline{) 73.10}$  | 7. $31 \overline{) 94.55}$  | 8. $26 \overline{) 89.70}$  | 9. $27 \overline{) 64.53}$  | 10. $15 \overline{) 70.20}$ |
| 11. $53 \overline{) 89.04}$ | 12. $31 \overline{) 67.89}$ | 13. $46 \overline{) 93.38}$ | 14. $28 \overline{) 92.12}$ | 15. $20 \overline{) 47.80}$ |

16. School Choir.

21 members bought T-Shirts.

Total cost was \$61.95.

How much for each T-Shirt?

\$2.95



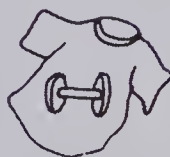
17. Fitness Club.

28 members bought T-Shirts.

Total cost was \$89.32.

How much for each T-Shirt?

\$3.19



Write each quotient to complete the patterns.

- |                              |                         |                         |
|------------------------------|-------------------------|-------------------------|
| 18. $27 \overline{) 972}$    | $27 \overline{) 97.2}$  | $27 \overline{) 9.72}$  |
| 19. $22 \overline{) 5192}$   | $22 \overline{) 519.2}$ | $22 \overline{) 51.92}$ |
| ★ 20. $35 \overline{) 3745}$ | $35 \overline{) 374.5}$ | $35 \overline{) 37.45}$ |

Division of decimals 2-digit divisor, 3-digit quotient 277

## OBJECTIVE

To divide a decimal by a 2-digit whole number resulting in a 3-digit quotient

## PACING

Level A 1-5, 11-16, 18

Level B 1-10, 16-19

Level C 6-20

## RELATED AIDS

HMS — DM69.

## SUGGESTIONS

**Initial Activity** If necessary, review division of whole numbers by 2-digit divisors.

*Example*

$$\begin{array}{r} 36 \\ 24 \overline{) 864} \\ \underline{72} \phantom{00} \\ 144 \phantom{00} \\ \underline{144} \phantom{00} \\ 0 \end{array}$$

Have students explain each step of the algorithm and describe the estimation procedures used.

## USING THE BOOK

Relate the review discussed during the Initial Activity to the example in the pupil display. Have students recall the rule developed in Exercises 19 to 22 on page 275 for placement of the decimal point.

Have students use multiplication periodically to check the exercises.

## ACTIVITIES

1. This page is closely related to page 276. See the Activities listed there.

2. Once all of the exercises have been completed and corrected, have them neatly written on the chalkboard showing divisor, dividend, and quotient.

*Examples*

$1.98$	$2.15$
(a) $32 \overline{) 63.36}$	(b) $25 \overline{) 53.75}$

Have the students pick 5 from the board and rewrite each in their work-books with 2 related division facts.

*Example*

$1.98$	$198$	$0.198$
(a) $32 \overline{) 63.36} \rightarrow$	$32 \overline{) 6336} \rightarrow$	$32 \overline{) 6.336}$

## OBJECTIVE

To provide computational practice using a game format

## PACING

Level A All  
Level B All  
Level C All

## USING THE BOOK

The use of math games can be an effective method for reviewing and maintaining computational skills. You may want to incorporate some of the following suggestions.

1. Reproduce copies of the game board or have students construct larger copies on coloured Bristol board.

2. Games involving computational skills often work best when played by groups of students who have approximately the same level of ability.

3. If the game is to be used at an activity centre, ensure that all students have an opportunity to play the game.

4. Games can lose their effectiveness if they are overused. As students begin to lose interest, put the game away and reintroduce it at a later time.

5. Be sure that students understand the rules and the object of the game. You might explain the instructions to the entire class, or work with a small group of students and have them teach the others in the class.

6. More able students are quite adept at modifying or changing rules. Once they become familiar with the original game, you might encourage these students to modify it. For example, they may wish to stress strategy rather than computational practice. Calculators could be used to facilitate the computational aspect of the game.

### Examples

(a) Square the numbers shown on the dice.

$$(3, 4) \rightarrow 3^2 = 9 \\ 4^2 = 16$$

(b) Sum the digits of the products.

$$3^2 = 9 \rightarrow \textcircled{9} \\ 4^2 = 16 \rightarrow 1 + 6 = \textcircled{7}$$

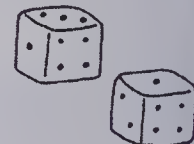
(c) Choose either number to represent the number of spaces to be moved. The object here, however, is to try to land on a prime number which gives a player a bonus move of 5 spaces ahead.

7. Some students may wish to obtain or construct dice (e.g., from cardboard, sponge, wood, or commercial plastic) and change the numbers on

## Go Ahead, Back Up!

Play this  
game with  
some  
classmates.

30	31	36	37	42	43	44	45
29	32	35	38	41	48	47	46
28	33	34	39	40	49	50	51
27	26	25			54	53	52
22	23	24			55	56	57
21	20	19	10	9	4	3	58
16	17	18	11	8	5	2	59
15	14	13	12	7	6	1	60
							Start
							Finish



**Materials:**

- 2 dice each with the numbers 1, 2, 3, 4, 5, and 6
- 2 to 4 players
- a coloured marker for each player
- game board

**Play:** Each player in turn rolls both dice, multiplies the two numbers face up on the dice, then subtracts the larger factor from the product. The difference represents the number of spaces the player may move on the game board. (If doubles are rolled, the player must move back the number of spaces equal to the value of one die. No player is required to move back farther than the starting gate.) First player to cross the finish line wins!

**Sample Play:** Sandy rolls  $\boxed{3} \boxed{4}$   $3 \times 4 = 12$   $12 - 4 = 8$  Go ahead 8 spaces.  
Mandy rolls  $\boxed{6} \boxed{1}$   $6 \times 1 = 6$   $6 - 6 = 0$  No move!  
Randy rolls  $\boxed{5} \boxed{5}$  — Doubles! . . . . . Back up 5 spaces.

**Variation:** Winner is that player to reach 60 with an exact roll!

each face, e.g., odd numbers, even numbers, multiples of 5, etc.

## Arrow Maps

What is the  
destination number  
of this arrow map?

$$\boxed{24} \xrightarrow{+} \xrightarrow{+} \xrightarrow{-} = ?$$



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- Step 1. Find the starting number on the grid above.  $\xrightarrow{\quad}$   $\boxed{24}$
- Step 2. Follow the direction for each arrow with your finger, writing the numbers and operations in your workbook  $\rightarrow 24 + 25 + 35 - 26$
- Step 3. Calculate to find the destination number of the map!  $\rightarrow 24 + 25 + 35 - 26 = \boxed{58}$   
Destination number is  $\boxed{58}$ .

### Exercises

What are the destination numbers of these maps?

$$\bullet \boxed{33} \xrightarrow{+} \xrightarrow{+} \xrightarrow{-} \xrightarrow{+} = ?$$

$$33 + 23 + 13 - 14 + ? = ? \quad 60$$

$$\bullet \boxed{6} \xrightarrow{\times} \xrightarrow{+} \xrightarrow{-} \xrightarrow{+} = ?$$

$$6 \times 7 + 8 - ? + ? = ? \quad 59$$

$$3. \boxed{89} \xrightarrow{-} \xrightarrow{+} \xrightarrow{-} \xrightarrow{+} = ? \quad 18$$

$$4. \boxed{5} \xrightarrow{\times} \xrightarrow{-} \xrightarrow{+} \xrightarrow{+} = ? \quad 35$$

$$5. \boxed{51} \xrightarrow{+} \xrightarrow{+} \xrightarrow{-} \xrightarrow{+} = ? \quad 13$$

$$6. \boxed{2} \xrightarrow{\times} \xrightarrow{-} \xrightarrow{+} \xrightarrow{-} = ? \quad 15$$

$$7. \boxed{40} \xrightarrow{+} \xrightarrow{-} \xrightarrow{+} \xrightarrow{+} \xrightarrow{+} \xrightarrow{-} = ? \quad 120$$

$$8. \boxed{5} \xrightarrow{\times} \xrightarrow{-} \xrightarrow{+} \xrightarrow{-} \xrightarrow{+} = ? \quad 58$$

$$9. \boxed{64} \xrightarrow{+} \xrightarrow{-} \xrightarrow{+} \xrightarrow{-} \xrightarrow{+} \xrightarrow{-} = ? \quad 65$$

$$10. \boxed{85} \xrightarrow{+} \xrightarrow{+} \xrightarrow{-} \xrightarrow{-} \xrightarrow{+} \xrightarrow{-} = ? \quad 254$$

Make some arrow maps for a classmate!

## OBJECTIVE

To provide computational practice using a number activity

## PACING

Level A All  
Level B All  
Level C All

## USING THE BOOK

You may want to make this a whole class activity or restrict it to those groups of students who have expressed interest. Whatever the case, be sure that students understand the steps involved and become familiar with the arrow symbols and the associated operations.

$+\uparrow$  means move up one space and add.

## ACTIVITIES

1. Some students might wish to create their own arrow codes and then exchange them with classmates. Provide, or have students construct, "arrow strips" to facilitate accuracy with coding and decoding. For example, diagonal moves are more easily represented in the confines of the boxes as shown. All of the boxes need not be used.

$$\boxed{33} \xrightarrow{+} \xrightarrow{-} \xrightarrow{+} \xrightarrow{-} \xrightarrow{-} \xrightarrow{-} = ?$$

2. Use the number grid to provide specific challenges. (Encourage students to develop their own, too.)

### Examples

(i) Using 56 as a starting number, draw an arrow map that leads to a destination number of 200.

$$\boxed{56} \xrightarrow{+} \xrightarrow{-} \xrightarrow{+} \xrightarrow{-} = ?$$

$$[56 + 67 + 77 = 200]$$

(ii) Using 46 as a starting number, draw an arrow map that leads to a destination number between 60 and 65. (If dividing, ignore remainders.) One possible solution is:

$$\boxed{46} \xrightarrow{\times} \xrightarrow{+} \xrightarrow{\div} \xrightarrow{+} = ?$$

$$[(46 \times 36) \div 26 = 63 \text{ (remainder 18)}]$$

3. The grid shown on the pupil page can also be used to play "Quad-Row" (see Variation 2) as described in the Activity Reservoir.



## OBJECTIVE

To evaluate expressions containing brackets

## PACING

Level A 1-15  
Level B 4-18  
Level C 7-21

## SUGGESTIONS

**Initial Activity** Present the class with an example of an expression such as this.

$$(3 + 3) \times 3 = \square$$

Have someone from the class come to the chalkboard, write a response in the box, and give a rationale.

$$(3 + 3) \times 3 = 18$$

Because  $3 + 3$  equals 6 and  $6 \times 3$  equals 18.

Using the chalkboard example erase the brackets and the correct response, and replace it with this.

$$3 + (3 \times 3) = \boxed{12}$$

Tell students that this is also a correct response, even though no numerals were changed. Discuss this, perhaps repeating with more examples and elicit from the students that (a) the different responses are because of the bracket placement, and (b) the brackets mean "do me first".

## USING THE BOOK

Read through the display information at the top of the pupil page and relate it to what was discussed during the Initial Activity demonstration.

Students who would benefit from a step-by-step procedure should be expected to evaluate the expressions in Exercises 1 to 12 as suggested in the display. Those students who are particularly adept at mental calculation might be permitted to use this shorter form.

$$1. \quad 3 + (5 \times 2) = 13$$

$$(3 + 5) \times 2 = 16$$

## ACTIVITIES

1. Provide more examples of the sort shown in Exercises 13 to 21 for students to complete. Students might enjoy creating some examples of their own.

2. See "Number Sentence" as described in the Activity Reservoir.

3. Provide the students with some "fill-in-the-blank" type expressions such as these.

$$(a) \quad (24 \div \blacksquare) + 5 = 11$$

$$(b) \quad 5 \times (5 + 5) = \blacksquare$$

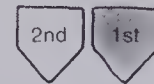
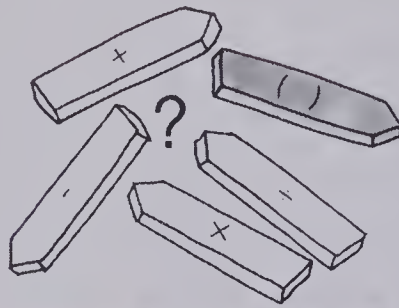
$$(c) \quad (8 - 3) + \blacksquare = 11$$

$$(d) \quad \blacksquare \div (10 + 15) = 2$$

$$(e) \quad (6 \times \blacksquare) - 8 = 40$$

$$(f) \quad 27 \div (9 \times \blacksquare) = 1$$

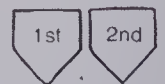
## Signals and Signposts



$$2 + (3 \times 6)$$

$$= 2 + 18$$

$$= 20$$



$$(2 + 3) \times 6$$

$$= 5 \times 6$$

$$= 30$$

What signal says  
"Do me first!"?

**Rule:** Perform operations within brackets first.

### Exercises

Perform the operations.

$$(a) \quad 3 + (5 \times 2) \quad 13$$

$$(b) \quad (3 + 5) \times 2 \quad 16$$

$$4. \quad (a) \quad 4 \times (5 + 9) \quad 56$$

$$(b) \quad (4 \times 5) + 9 \quad 29$$

$$7. \quad (a) \quad 21 - (6 + 7) \quad 8$$

$$(b) \quad (21 - 6) + 7 \quad 22$$

$$10. \quad (a) \quad 36 \div (3 + 3) \quad 6$$

$$(b) \quad (36 \div 3) + 3 \quad 15$$

$$(a) \quad (4 + 8) \div 2 \quad 6$$

$$(b) \quad 4 + (8 - 2) \quad 8$$

$$5. \quad (a) \quad 7 \times (8 - 2) \quad 28$$

$$(b) \quad (7 \times 8) \div 2 \quad 28$$

$$8. \quad (a) \quad (18 - 4) \div 2 \quad 7$$

$$(b) \quad 18 - (4 \div 2) \quad 16$$

$$11. \quad (a) \quad (16 \div 4) \times 2 \quad 8$$

$$(b) \quad 16 \div (4 \times 2) \quad 2$$

$$3. \quad (a) \quad (12 - 5) \times 2 \quad 14$$

$$(b) \quad 12 - (5 \times 2) \quad 2$$

$$6. \quad (a) \quad (24 \div 6) - 3 \quad 1$$

$$(b) \quad 24 \div (6 - 3) \quad 8$$

$$9. \quad (a) \quad (6 \times 8) - 5 \quad 43$$

$$(b) \quad 6 \times (8 - 5) \quad 18$$

$$12. \quad (a) \quad 7 \times (9 - 3) \quad 21$$

$$(b) \quad (7 \times 9) \div 3 \quad 21$$

★ Copy and insert brackets to make each number sentence true.

$$13. \quad (3 + 9) \div 3 = 4$$

$$14. \quad (4 \times 8) - 7 = 25$$

$$15. \quad 4 + (6 \div 2) = 7$$

$$16. \quad 15 - (8 + 2) = 5$$

$$17. \quad (8 + 4) \div 4 = 3$$

$$18. \quad 3 - (2 - 1) = 2$$

$$19. \quad (5 \times 9) + 6 = 51$$

$$20. \quad (40 \div 8) - 4 = 1$$

$$21. \quad 31 - (9 + 2) = 20$$

## A Skill-Testing Question

Win a new colour TV set!  
Send in 4 Crunchos' box tops and answer this skill-testing question!

$$8 + 2 \times 5$$

Annette wrote:

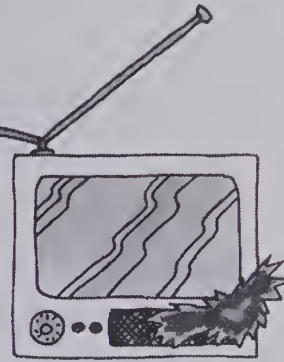
$$\begin{aligned} 8 + 2 \times 5 \\ = 10 \times 5 \\ = 50 \end{aligned}$$

?

Mario wrote:

$$\begin{aligned} 8 + 2 \times 5 \\ = 8 + 10 \\ = 18 \end{aligned}$$

Who is right?



Use the order of operations rule to decide.

If there are no brackets:

**First:** Perform all multiplication and division operations in left-to-right order;

**Second:** Perform all addition and subtraction operations in left-to-right order.

### Exercises

Perform the operations. Use the order of operations rule.

- |                                  |                               |                               |                                |
|----------------------------------|-------------------------------|-------------------------------|--------------------------------|
| 1. $5 + 6 \times 2$ <b>17</b>    | 2. $12 - 2 \times 3$ <b>6</b> | 3. $9 \div 3 - 2$ <b>1</b>    | 4. $3 \times 4 - 2$ <b>6</b>   |
| 5. $18 - 5 + 2$ <b>15</b>        | 6. $12 - 4 \div 4$ <b>11</b>  | 7. $3 + 5 \times 4$ <b>23</b> | 8. $11 + 6 - 3$ <b>14</b>      |
| 9. $8 \div 2 \times 4$ <b>16</b> | 10. $12 - 6 \div 3$ <b>10</b> | 11. $9 + 10 \div 5$ <b>11</b> | 12. $6 \times 7 + 8$ <b>50</b> |

Be careful with these!

- |   |   |                                      |
|---|---|--------------------------------------|
| 13. $2 + 3 \times 4 - 5$<br>$= 2 + 12 - 5$<br>$= 14 - 5$<br>$= 9$ | 14. $7 + 8 - 4 \times 3$ <b>3</b>       | 15. $6 \times 4 \div 8 + 5$ <b>8</b> |
| 16. $12 - 4 \times 3 - 2$ <b>7</b>                                | 17. $45 - 15 \div 3 \times 7$ <b>10</b> | 18. $18 + 4 - 9 + 5$ <b>18</b>       |
| 19. $7 + 8 \times 6 \div 12$ <b>11</b>                            | 20. $4 \times 7 - 21 \div 3$ <b>21</b>  | 21. $19 - 5 + 3 \times 10$ <b>44</b> |

Expressions, order of operations 281

## OBJECTIVE

To use order of operations where no brackets are used in the expressions

## PACING

Level A All  
Level B All  
Level C All

## SUGGESTIONS

**Initial Activity** At the chalkboard present the class with an expression such as:

$$6 \times 6 + 6 = \square$$

Have volunteers come to the board and demonstrate the two possible answers (i.e., 72 and 42). Point out the potential dilemma in such instances and the two generally agreed upon rules that are listed in the box in the display on the pupil page. Ask: "Using the rule, what is the correct answer to our problem?" [42]

Repeat using other examples. You may wish to post the rules somewhere in the class for future use.

## USING THE BOOK

Discuss the two rules presented for order of operations. Have students apply these rules by stating why Annette's answer is incorrect and Mario's is correct. Try other examples at the chalkboard, including some that use three operations (as in Exercises 13 to 21). Establish the format to be used (e.g., Exercise 13).

Some students may wish to draw brackets around that part of the expression to be done first. While this is not incorrect, brackets are superfluous.

*Example*

$$\begin{aligned} 5 + 6 \times 2 \\ = 5 + 12 \\ = 17 \end{aligned}$$

The order of operations rules say that multiplication is done before addition, so brackets aren't necessary.

$$\begin{aligned} 5 + (6 \times 2) \\ = 5 + 12 \\ = 17 \end{aligned}$$

Brackets are generally used to override another rule.

*Examples*

$$12 - 4 \div 4 \text{ and } (12 - 4) \div 4$$

- |  |                 |
|--|-----------------|
| (a) $12 - 4 \div 4$<br>$= 12 - 1$<br>$= 11$    | Divide first.   |
| (b) $(12 - 4) \div 4$<br>$= 8 \div 4$<br>$= 2$ | Subtract first. |

## ACTIVITIES

1. Because these two pages are so closely related, see the ideas listed on page 280 of the teaching notes.
2. See "Input-Output" as described in the Activity Reservoir.
3. See "Spider and the Fly" as described in the Activity Reservoir. Be sure to use some order of operations expressions among the skill cards. You may wish to use the Extra Practice on pupil pages 342 and 343 as one source of problems.

## OBJECTIVE

To use order of operations to evaluate number expressions

## PACING

Level A 1-25

Level B 1-25

Level C 1-12, 17-27

## RELATED AIDS

CALC. W/BK — 19.

## USING THE BOOK

Use the material in the pupil display to consolidate the work done on pages 280 and 281. Students might like to develop their own acronym to assist them to remember the order of operations (BMDAS).

### Example

Beverly Makes Delicious Apple Strudel.

Provide chalkboard examples that include three operations (e.g., Exercises 16 to 27).

Those few students whom you might have permitted to solve expressions mentally should be encouraged to write out the full solutions for Exercises 17 to 27.

## ACTIVITIES

1. Use the number cards from a deck of ordinary playing cards. (Aces (1) to 9.) Have a student draw three cards from the deck. Each group tries to make as many true number expressions as they can using the three numbers, any of the four operations, and brackets if desired.

### Example

Numbers drawn: 3, 8, and 6.

- (i)  $3 \times 6 + 8$  (ii)  $6 \div 3 + 8$   
(iii)  $8 \times 3 \div 6$  (iv)  $(6 + 8) \times 3$   
(v)  $8 - 3 + 6$  (vi)  $8 \times (6 - 3)$

2. If you have not already done so, see the Activities suggested for pages 280 and 281 in the teaching notes.

3. Some students might enjoy writing their own expressions for exchange with classmates. Challenge them by asking for three expressions; one with a value between 10 and 20, a second between 40 and 50, and a third between 70 and 80.

## Some Do, Some Don't

This expression has brackets.

$$\begin{aligned}(6 + 8) \div 2 \\&= 14 \div 2 \\&= 7\end{aligned}$$

This one doesn't.

$$\begin{aligned}5 + 3 \times 2 \\&= 5 + 6 \\&= 11\end{aligned}$$

This is how Andrea remembers order of operations.

Brackets first (if any)

Multiplication and

Division in left-to-right order

Addition and

Subtraction in left-to-right order

Bless

My

Dear

Aunt

Sally

This will help  
you remember

### Exercises

Perform the operations.

1.  $(7 + 8) \div 3$  5

4.  $12 + 24 \div 4$  18

7.  $11 + 5 - 3$  13

10.  $15 - 3 - 4$  1

13.  $7 \times 8 + 3$  59

2.  $14 - 2 \times 5$  4

5.  $6 \times 7 - 10$  32

8.  $5 \times 8 \div 4$  10

11.  $20 \div (5 \times 2)$  2

14.  $(9 + 1) \times 6$  60

3.  $5 \times (4 + 2)$  30

6.  $(14 - 7) \times 9$  63

9.  $24 \div (7 + 5)$  2

12.  $(14 - 3) \times 5$  55

15.  $2 \times 3 \times 4$  24

Be careful with these!

16.  $(6 + 8) \div 2 + 5$   
 $= 14 \div 2 + 5$   
 $= 7 + 5$   
 $= 12$

4.  $7 + 8 - 4 \times 3$  3

7.  $25 \div (4 + 1) - 5$  0

19.  $9 \times 7 + 3 \times 7$  84

20.  $(16 - 9) \times (12 - 4)$  21

21.  $28 - (5 + 2) \times 8$  32

22.  $12 + 8 + 5 \times 3$  35

23.  $(6 \times 8) - (6 - 2)$  12

24.  $23 - 2 \times 8 - 2$  5

25.  $(14 + 10) \div 2 - 5$  7

★ 26.  $8 \times (9 - 3) \div 3$  16

★ 27.  $4 \times 5 - 4 \times 5$  25



## Number-Cube Challenge

Try this!

Place the 3 number cubes  
to make true number sentences.

1.  $\begin{array}{|c|} \hline 5 \\ \hline \end{array} - \begin{array}{|c|} \hline 3 \\ \hline \end{array} - \begin{array}{|c|} \hline 1 \\ \hline \end{array} = 1$

3.  $\begin{array}{|c|} \hline 5 \\ \hline \end{array} - (\begin{array}{|c|} \hline 3 \\ \hline \end{array} - \begin{array}{|c|} \hline 1 \\ \hline \end{array}) = 3$

5.  $(\begin{array}{|c|} \hline 3 \\ \hline \end{array} + \begin{array}{|c|} \hline 5 \\ \hline \end{array}) \times \begin{array}{|c|} \hline 1 \\ \hline \end{array} = 8$

7.  $\begin{array}{|c|} \hline 5 \\ \hline \end{array} \times (\begin{array}{|c|} \hline 3 \\ \hline \end{array} - \begin{array}{|c|} \hline 1 \\ \hline \end{array}) = 10$

9.  $\begin{array}{|c|} \hline 3 \\ \hline \end{array} \times \begin{array}{|c|} \hline 5 \\ \hline \end{array} - \begin{array}{|c|} \hline 1 \\ \hline \end{array} = 14$

Use these number  
cubes only.

2.  $(\begin{array}{|c|} \hline 1 \\ \hline \end{array} + \begin{array}{|c|} \hline 5 \\ \hline \end{array}) \div \begin{array}{|c|} \hline 3 \\ \hline \end{array} = 2$

4.  $\begin{array}{|c|} \hline 3 \\ \hline \end{array} + \begin{array}{|c|} \hline 5 \\ \hline \end{array} - \begin{array}{|c|} \hline 1 \\ \hline \end{array} = 7$

6.  $\begin{array}{|c|} \hline 1 \\ \hline \end{array} + \begin{array}{|c|} \hline 3 \\ \hline \end{array} + \begin{array}{|c|} \hline 5 \\ \hline \end{array} = 9$

8.  $(\begin{array}{|c|} \hline 5 \\ \hline \end{array} - \begin{array}{|c|} \hline 1 \\ \hline \end{array}) \times \begin{array}{|c|} \hline 3 \\ \hline \end{array} = 12$

10.  $\begin{array}{|c|} \hline 3 \\ \hline \end{array} \times \begin{array}{|c|} \hline 5 \\ \hline \end{array} + \begin{array}{|c|} \hline 1 \\ \hline \end{array} = 16$

Now try this!

Make true number sentences

- Use each of the number cubes.
- Use any combination of +, -,  $\times$ , and  $\div$ .
- Use brackets where necessary. *Other answers possible.*

11.  $\begin{array}{|c|} \hline 5 \\ \hline \end{array} - \begin{array}{|c|} \hline 3 \\ \hline \end{array} - \begin{array}{|c|} \hline 1 \\ \hline \end{array} = 0$

13.  $\begin{array}{|c|} \hline 3 \\ \hline \end{array} + \begin{array}{|c|} \hline 1 \\ \hline \end{array} - \begin{array}{|c|} \hline 2 \\ \hline \end{array} = 2$

15.  $\begin{array}{|c|} \hline 3 \\ \hline \end{array} + \begin{array}{|c|} \hline 2 \\ \hline \end{array} - \begin{array}{|c|} \hline 1 \\ \hline \end{array} = 4$

17.  $\begin{array}{|c|} \hline 1 \\ \hline \end{array} + \begin{array}{|c|} \hline 2 \\ \hline \end{array} + \begin{array}{|c|} \hline 3 \\ \hline \end{array} = 6$

19.  $(\begin{array}{|c|} \hline 3 \\ \hline \end{array} + \begin{array}{|c|} \hline 1 \\ \hline \end{array}) \times \begin{array}{|c|} \hline 2 \\ \hline \end{array} = 8$

12.  $\begin{array}{|c|} \hline 3 \\ \hline \end{array} \times \begin{array}{|c|} \hline 1 \\ \hline \end{array} - \begin{array}{|c|} \hline 2 \\ \hline \end{array} = 1$

14.  $\begin{array}{|c|} \hline 3 \\ \hline \end{array} \times (\begin{array}{|c|} \hline 2 \\ \hline \end{array} - \begin{array}{|c|} \hline 1 \\ \hline \end{array}) = 3$

16.  $\begin{array}{|c|} \hline 2 \\ \hline \end{array} \times \begin{array}{|c|} \hline 1 \\ \hline \end{array} + \begin{array}{|c|} \hline 3 \\ \hline \end{array} = 5$

18.  $\begin{array}{|c|} \hline 2 \\ \hline \end{array} \times \begin{array}{|c|} \hline 3 \\ \hline \end{array} + \begin{array}{|c|} \hline 1 \\ \hline \end{array} = 7$

20.  $\begin{array}{|c|} \hline 3 \\ \hline \end{array} \times (\begin{array}{|c|} \hline 1 \\ \hline \end{array} + \begin{array}{|c|} \hline 2 \\ \hline \end{array}) = 9$

Constructing true number expressions 283

## OBJECTIVES

To create number expressions with  
selected numbers and signs of  
operation given

To create number expressions with  
selected numbers given but with no  
signs of operation provided

## PACING

Level A Optional

Level B Optional

Level C Optional

## BACKGROUND

The exercises on pages 280 to 282  
provide students with practice in  
“decoding” number expressions. The  
exercises on this page provide students  
with the complementary skill of  
“encoding” or building expressions.

## SUGGESTIONS

**Initial Activity** If necessary, briefly  
review order of operations. Help  
students to distinguish between the  
exercises on this page and those on  
preceding pages.

## USING THE BOOK

Most students should be able to solve  
Exercises 1 to 10 using the simple  
inspection or “trial-and-error”  
approach. Encourage less able students  
to solve as many as they can.

Exercises 11 to 20 are more  
difficult, and as a result, you may wish  
to encourage only the more able  
students to attempt them.

**OBJECTIVE**  
To calculate the average of a series of numbers

**PACING**  
Level A All  
Level B All  
Level C All

**RELATED AIDS**  
CALC. W/BK — 10, 41.

**BACKGROUND**  
“Average” in this lesson is equivalent to “arithmetic mean” (the sum of the data divided by the number of data). The “mean” should not be confused with other measures of central tendency — the median or the mode. Much of the data collected during the Activities suggested on this page could be saved for later graphing (pages 290 to 293).

**SUGGESTIONS**  
**Initial Activity** Discuss with students the word “average” and its use in everyday life, e.g., an “average day”, a swimmer of “average ability”, an “average student”, and so on. Elicit the “middle of the road” connotation; neither “terrible” nor “terrific”.

Illustrate the similarity of this definition of average to its usage in mathematics with examples such as:  
1. The “You-Name-It” school baseball team has played five games. They have scored 5, 7, 4, 5, and 9 runs in those games in that order. The team *averages* 6 runs per game.  
2. The “You-Name-It” school baseball games took this long to play: 63 min, 44 min, 52 min, 47 min, and 49 min. The games’ *average* length is 51 min.

Stress the “middle of the road” connotation again. Point out that averages don’t tell us about the worst or best, the shortest or longest, etc. Rather, they tell, about how good, about how long, about how fast someone or something *usually* is (or *usually* performs).

Show the procedure for calculating the “averages” in the above examples (i.e., sum the data and divide).

Robert Nelson is training for the Canadian Weightlifting Championship!

**Weightlifting**

Here is his score card for the weightlifting competition!



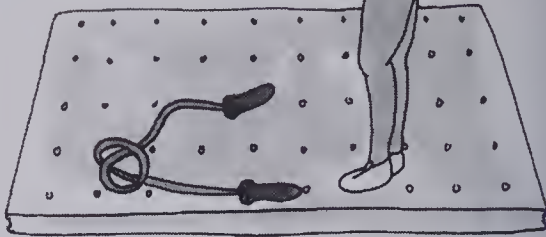
First lift	—	75 kg
Second lift	—	80 kg
Third lift	—	73 kg



What is Robert Nelson’s **average** lift?

$(75 + 80 + 73) \div 3 = 76$

Total Sum of Lifts	Number of Lifts	Average Lift
228	3	76



**Exercises**

1. Here is Paul LaFleur’s score card.

First lift	—	66 kg
Second lift	—	63 kg
Third lift	—	71 kg
Fourth lift	—	68 kg

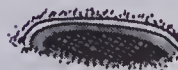
- (a) What is the sum of all the lifts? **268 kg**  
(b) How many lifts are there altogether? **4**  
(c) What is Paul LaFleur’s average lift? **67 kg**

2. Here is a record of some practice lifts made before the championships. Find the average lift of each weight lifter.

	Name	Practice Lifts (in kilograms)						Average Lift
		1st	2nd	3rd	4th	5th	6th	
(a)	Doug Schott	56	51	58	51	—	—	■ <b>54 kg</b>
(b)	Guy LeBlanc	65	64	69	62	70	—	■ <b>66 kg</b>
(c)	Dale Brown	41	40	45	—	—	—	■ <b>42 kg</b>
(d)	Fred Simms	83	82	77	80	85	85	■ <b>82 kg</b>
(e)	George White	73	81	74	68	—	—	■ <b>74 kg</b>

## The World of Sports

Punt Return	Al Schroeder made the following returns. What was his average return? <b>35</b> 28, 39, 40, 33.
Golf Classics	Peggy Bradshaw made these scores for 3 rounds. What was her average score? <b>71</b> 67, 74, 72.
Goals Against	The goalie for the Northern Flyers has this score for a 5-game series. What is his average? <b>2</b> 2, 1, 3, 2, 2.
Gymnastics	During the Senior Women's Event, Nancy Young obtained the following scores. What was her average score? <b>8.1</b> 9.5, 7.6, 9.2, 5.8, 8.4.
Hockey	Robert Perreau received these points for goals and assists over a 7-game series. What is his average? <b>2</b> 2, 1, 4, 1, 2, 1, 3.
Swimming	The Dairy City Relay Team received these times for each 100 of a 400 m relay. What was the average time? <b>60</b> 60, 61, 58, 61.
Auto Rally	The driver for the Valleyview Racing Team received scores for each checkpoint. What was his average score? <b>16</b> 18, 15, 12, 14, 19, 18.



Finding averages 285

## USING THE BOOK

Read through the information about Robert Nelson together. Emphasize: (a) the relationship of the average lift to the actual lifts (i.e., neither least or greatest but somewhere in the middle); (b) how the average was calculated.

Work together with the students on Exercise 1 to reinforce the idea of "average". Before assigning Exercise 2, be certain that students understand how the divisor is found.

### Examples

Doug Schott — 4 lifts, therefore divide the sum by 4.

Fred Simms — 6 lifts, therefore divide the sum by 6.

Read through the seven word problems on page 285 together and be certain that the reading level is not a complicating factor. Again, you may wish to emphasize the origin of the various divisors.

Before assigning the exercises, be certain that the pupils are familiar with an accepted answer format.

## ACTIVITIES

1. Have the pupils measure and record some averages in the class (i.e., average height of math group in centimetres; average mass in kilograms; average temperature outside window during the day; average length of a series of lines taped on the floor; etc.).

2. Pupils might enjoy calculating some of their own individual or group averages in performing various sports events (e.g., average running time for 50 m; average number of bent-knee situps in 60 s; average length of time in flexed-arm hang; average number of bean bags thrown into a garbage pail from 10 m out of 10 throws; etc.).

3. Have the pupils interview, record, and report on some "averages" as they exist in the school (e.g., average number of pupils per class or grade; average height in centimetres of children per grade; average length of teachers' cars; average number of minutes of TV watched per day; etc.).



**OBJECTIVE**  
To calculate average speed

**PACING**  
Level A All  
Level B All  
Level C All

**RELATED AIDS**  
HMS — DM70.

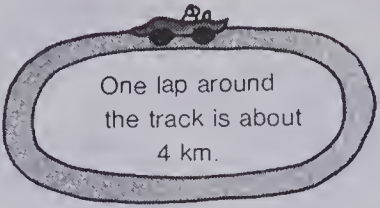
**BACKGROUND**  
The famous “Indianapolis 500” has been converted (in this lesson) to metric, thus, the “Indy 800”.

**SUGGESTIONS**  
**Initial Activity** Students who are familiar with car racing may wish to share their interest and knowledge with the rest of the class. Terms such as pit stop, pit crew, checkered flag, yellow flag, tachometer, and kilometres per hour might be discussed.

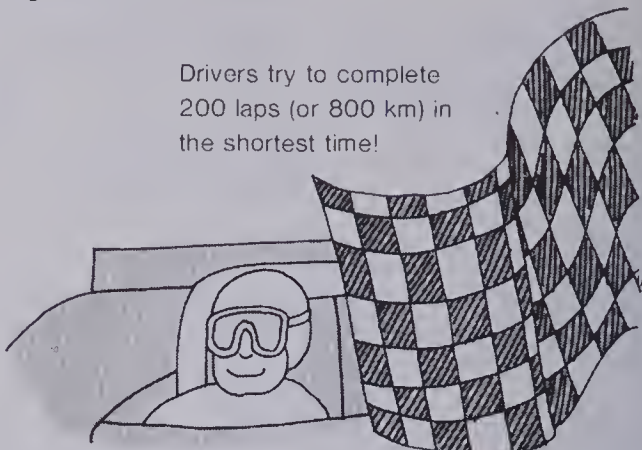
**USING THE BOOK**  
Students should not be required to copy the chart. The drivers’ names and average speeds should be sufficient.

**ACTIVITIES**  
1. If you have not already done so, see the Activities listed on pages 284 to 285 in the teaching notes.  
2. The students may be interested in computing some of their “personal speeds” (with each others’ and the teacher’s help).  
Use a trundle wheel or metric tape to measure distances students might walk, jog, or run in 10 s. (Starting from a start line at “Go!” and dropping a baton when a timer who has timed 10 s calls “Drop!” will help keep measurements fairly accurate.) Have the students record their distances. Dividing their distances by 10 will yield their personal m/s (metres per second) rate.

### "Indy 800"



Drivers try to complete 200 laps (or 800 km) in the shortest time!



Al Ferrati made 3 practice laps.


1st lap — 241 km/h  
2nd lap — 223 km/h  
3rd lap — 250 km/h

What was Al Ferrati's average speed?

**Exercises**

Other drivers made practice laps. Find the *average speed* for each driver for the number of laps driven.

	Driver	Practice Laps (in km/h)						Average Speed
		# 1	# 2	# 3	# 4	# 5	# 6	
(a)	Rod Emerson	198	171	185	190	—	—	■ 186 km/h
(b)	Wendy Graham	216	206	225	224	224	—	■ 219 km/h
(c)	Mike Taylor	240	225	243	—	—	—	■ 236 km/h
(d)	Conrad Dent	223	211	—	—	—	—	■ 217 km/h
(e)	Phil Laver	247	229	240	235	240	243	■ 239 km/h
(f)	Tom Barlow	228	236	222	232	232	—	■ 230 km/h



# BRAINTICKLER

Using any of the 4 operations (and brackets if necessary), make the numbers from 1 to 10 with 3's only.

The first one is done for you! *Other answers possible.*

$$\begin{aligned} & (\boxed{3} + \boxed{3}) \div (\boxed{3} + \boxed{3}) = 1 \\ & \boxed{3} \div \boxed{3} = 3 \\ & \boxed{3} \times \boxed{3} = 9 \\ & (\boxed{3} \times \boxed{3}) \div (\boxed{3} + \boxed{3}) = 4 \\ & (\boxed{3} + \boxed{3}) \div (\boxed{3} + \boxed{3}) = 1 \\ & (\boxed{3} + \boxed{3}) \div (\boxed{3} + \boxed{3}) = 1 \\ & \boxed{3} \div \boxed{3} = 3 \\ & (\boxed{3} \times \boxed{3}) \div (\boxed{3} + \boxed{3}) = 4 \\ & \boxed{3} \times \boxed{3} = 9 \\ & \boxed{3} \div \boxed{3} = 3 \\ & \boxed{3} \times \boxed{3} = 9 \end{aligned}$$

Try using 5's.

## OBJECTIVE

To create number expressions

## PACING

Level A Optional

Level B Optional

Level C Optional

## BACKGROUND

This exercise is an extension of those presented on page 283. The difficulty level is increased by using four identical numbers (e.g., 3). Note that the exercise is of the "encoding" or building type, which requires a sound understanding of the order of operations.

## USING THE BOOK

While the more able students will be most successful with this exercise, encourage all students to solve as many as possible. Suggest that the expressions need not be done in order, e.g., while trying to solve the expression for 2, a student may inadvertently solve the expression for 5.

## OBJECTIVE

To read and interpret circle graphs

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

HMS — DM71.

## USING THE BOOK

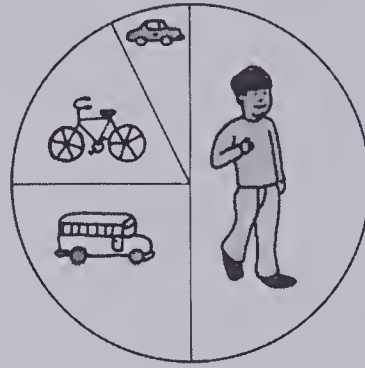
You may wish to use these two pages as an oral exercise. The graphs and their accompanying questions could be used as a basis for some informal data gathering in your own classroom or school.

By a show of hands, find out how the students in your classroom come to school. Compare the results to those in the first graph in the student's text. While the graph provides no numerical data, some sample comparisons can be made, e.g., about half the students walk to school, about a fourth ride the bus. How does this data compare with the informal survey taken in your classroom?

The other graphs on pages 288 and 289 could be used in a similar manner. You might pose questions such as, "How might a TV network use the Favourite TV Sports graph to adjust its sports programs?" "How could a radio station use the Favourite Kinds of Music graph?"

## Circle Graphs

HOW STUDENTS COME TO SCHOOL



Some **circle graphs** use pictures.

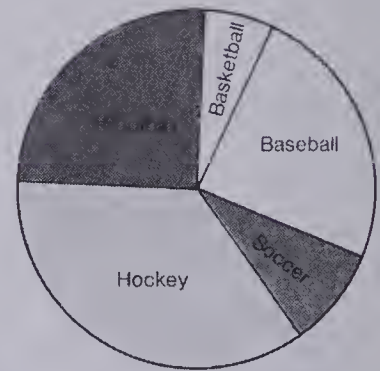
1. What does each picture represent?  
*The students' means of coming to school.*
2. How do most students come to school?  
*They walk.*
3. How do the fewest students come to school?  
*By car.*
4. Do more students ride their bicycles or take the bus to school?  
*Take bus.*
5. About what fraction of the students walk to school?  
 *$\frac{1}{2}$*

Some circle graphs use words.

The Grade 5 students at Meadowvale School were asked which sports they enjoyed watching the most.

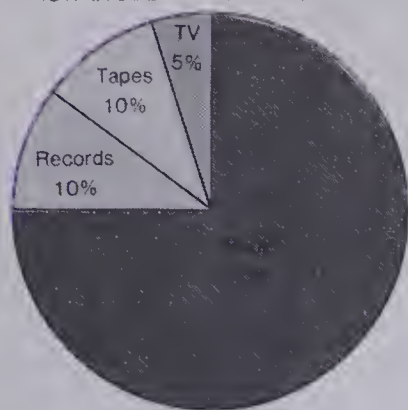
6. Which sport did most students enjoy watching?  
*Hockey*
7. Which sport did the fewest students enjoy watching?  
*Basketball*
8. Which is more popular, football or soccer?  
*Football*
9. Which two sports are enjoyed equally well?  
*Football and baseball.*

FAVOURITE TV SPORTS





HOW STUDENTS LISTEN TO MUSIC



Some circle graphs use percent.

All of the Grade 5 students at Fairview School were asked how they listened to music.

10. What percent of all the students like to listen to music on
  - (a) radio? **75%**
  - (b) tapes? **10%**
  - (c) records? **10%**
  - (d) TV? **5%**
11. (a) Find the sum of the percents. **100%**  
 (b) What does this sum represent?

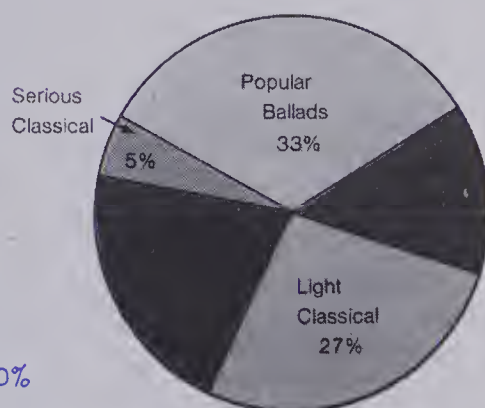
12. What is the most popular method for listening to music? **Radio**
13. What two methods are equally popular? **Tapes and records**
14. How do you listen to music? How do your friends listen to music?

**All of the Grade 5 students at Fairview School.**

People in a neighbourhood were asked about their favourite kinds of music.

15. (a) Find the sum of the percents. **100%**  
 (b) What does this sum represent? **All of the people asked.**
16. Which is more popular:
  - (a) Rock 'n' Roll or Country and Western? **Rock 'n' Roll**
  - (b) Rock 'n' Roll or Light Classical? **Light Classical**
17. What percent of the people listen to
  - (a) Popular Ballads and Light Classical? **60%**
  - (b) Serious Classical and Country and Western? **19%**

FAVOURITE KINDS OF MUSIC



Interpreting circle graphs 289

## ACTIVITIES

1. Students could be encouraged to bring circle graphs found in newspapers and magazines to class. The primary objective would be to have students read, interpret, and discuss the graphs. In addition this might provide an opportunity to discuss how artists make creative use of colour, cartoons, sketches, and other devices to heighten the impact of the displayed data.

2. Some students may wish to make some simple computations with the circle graphs on page 289.

**Example**

80 students at Fairview School were asked how they listened to music. How many students listened to radios? records? tapes? TV?

**Radio**

$$75\% \rightarrow \frac{75}{100} \rightarrow 0.75 \rightarrow 0.75 \times 80 = 60$$

**Records**

$$10\% \rightarrow \frac{10}{100} \rightarrow 0.1 \rightarrow 0.1 \times 80 = 8$$

**Tapes**

**TV** and so on.

3. A few of the more able students might want to know about construction of circle graphs. Provide them with very simple data at first.

**Example**

Favourite Fruit

Fruit	Number of Students
Oranges	40
Apples	20
Grapes	10
Bananas	10
Total = 80	

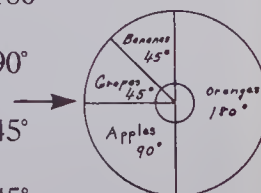
Each group of students is represented by a certain segment of the circle. The size of the segment is determined by multiplying the ratio of each group to the total, times 360° (the total number of degrees in a circle). The degrees are measured in the circle using a protractor.

$$\text{Oranges } \frac{40}{80} \times 360 = 180^\circ$$

$$\text{Apples } \frac{20}{80} \times 360 = 90^\circ$$

$$\text{Grapes } \frac{10}{80} \times 360 = 45^\circ$$

$$\text{Bananas } \frac{10}{80} \times 360 = 45^\circ$$



A few students may wish to display the data gathered informally in the classroom discussions by constructing circle graphs.

## OBJECTIVE

To construct a pictograph and bar graph

## PACING

Level A 1-4  
Level B All  
Level C All

## MATERIALS

graph paper

## SUGGESTIONS

**Initial Activity** Discuss with students the three steps used to construct the pictograph on page 290. Note the characteristics of the pictograph: title, colours identified in each row, symbols carefully drawn. Refer particularly to the fact that each symbol represents two students (1:2 correspondence).

## USING THE BOOK

Use Exercises 1 and 2 orally. Discuss with students the meaning of the half symbols used for green and yellow. Ask students why Reta and Brant used 1:2 correspondence rather than 1:1 correspondence. [Fewer symbols are needed.]

Discuss with students the characteristics of the bar graph on page 291 which displays the same data: title, colours identified, bars evenly spaced, bars the same width, number of students starts at zero, intersection of the vertical and horizontal axes and progresses by ones in equal intervals.

The answers to Exercise 3 may require some discussion. The pictograph permits us to make *general* comparisons very easily (e.g., red is obviously the colour chosen most often; brown is chosen least often). The bar graph shows the same contrasts but allows us to make numerical comparisons much more easily (e.g., 12 chose red, 2 chose brown). In the pictograph, we must count the number of symbols and multiply by 2.

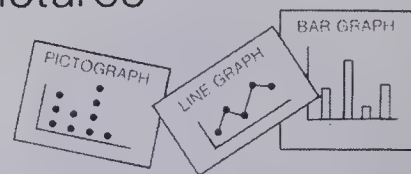
Because Exercise 4 relates to *numerical* comparisons, the bar graph helps us most.

Allow students time to read the three parts of Exercise 5 before assigning it. You may wish to have a show of hands to obtain data for the chart (or have each student place his or her choice on a piece of paper to be collected and organized). The choice of graph in step 3 will depend on desired comparisons, e.g., general comparisons (pictograph) or numerical comparisons (bar graph).

You may want to have students work in small groups. The construction

## Information Pictures

Graphs are pictures that display information.



Reta and Brant used these 3 steps to construct a graph.

Step 1. Choose a question.



Reta and Brant asked, "What are the favourite colours in our class?"

Step 2. Collect and organize the information to answer the question.



They recorded the choice of each student.

Colour	Tally	Number
Blue		8
Green		5
Red		12
Brown		2
Yellow		5

Step 3. Construct a graph that pictures your information clearly.



They constructed a **pictograph**.

FAVOURITE COLOURS OF OUR CLASS

Blue	☺ ☺ ☺ ☺	
Green	☺ ☺ ☺ ☺ ☺	
Red	☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺	
Brown	☺ ☺	
Yellow	☺ ☺ ☺ ☺	

Each ☺ represents 2 students

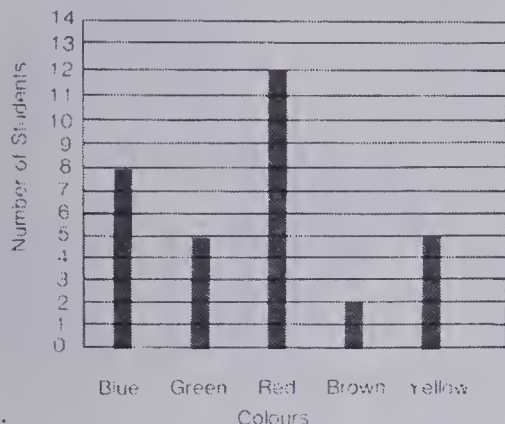
Reta and Brant presented their *pictograph* to the class.

Help them to answer these questions.

- How many chose red? yellow? blue? green? brown?  
12 5 8 5 2
- How many more students chose red than yellow? blue than brown? red than blue?  
6 4

Randy and Maria used the same information to construct a **bar graph**.

FAVOURITE COLOURS OF OUR CLASS



- Which of the two graphs do you think pictures the information best?  
*Bar graph*
- Which of the two graphs makes it easier to answer Exercises 1 and 2?  
*Bar graph*



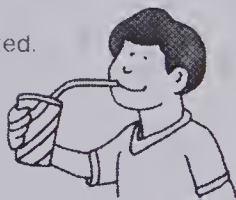
- Let's conduct an experiment!

**Step 1** Ask this question: "Of the soft drinks on this list, which is your favourite?"

**Step 2.** Collect and organize the information.  
Record the choice of each person on a table like this.  
How might you find out each person's choice?

Soft Drink	Tally	Number
Ginger Ale		
Cola		
Orange		
Root Beer		

**Step 3.** Construct a graph, using the information you have collected.  
Which kind of graph would you choose?



of graphs on large sheets of graph paper can provide a vehicle for group cooperation and decision making. The completed graphs could be displayed around the room. Each group could explain why they chose a particular type of graph.

## ACTIVITIES

- Have students bring graphs from newspapers and magazines. Discuss with students the similarities and differences between their graphs and those found in the media.
- Individuals or groups of students could be encouraged to conduct one of the experiments listed on the top of page 292. Explain to students the difference between "unlimited" and "limited" information. For example, if an experimenter asks, "What is your favourite ice cream?", he or she may receive as many different selections as there are people in the sample population. This "unlimited" approach may show a broad range of selection, but it does little to show a hierarchy of favourites. Using the "limited" approach, an experimenter selects a limited number of choices and asks, "Of these 5 flavours, which is your favourite?" In this case, the data are more easily collected and displayed.



## OBJECTIVES

To construct a broken line graph  
To provide practice in multiplication,  
division, and order of operations

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

graph paper

## BACKGROUND

Circle graphs, pictographs, and bar graphs are generally used to compare specific items at a certain point in time.

While the broken line graph permits comparisons, its real value is in showing trends over a period time (e.g., sales, temperature).

## USING THE BOOK

Exercise 1 provides a follow up to pages 290 and 291. The collection and display of information could be conducted as a specific lesson, or over a period of time. Whatever the case, you will want to review with students the three steps used to construct a graph. Also, review the explanatory discussion found in the teaching notes in Activity 2 for pages 290 and 291 (i.e., "limited" and "unlimited" information).

In Exercise 2, discuss the information by asking: "At what time was the highest (lowest) temperature recorded?" "When did the greatest temperature decrease (increase) occur?"

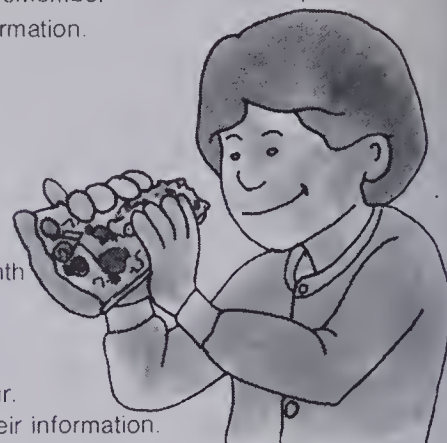
Discuss with students the characteristics of the graph. Clues to the construction of such a graph could be given by asking: "Why is this graph called a *broken line graph*?" [Line segments are used to join "dots" which represent hourly recorded temperatures.]

In order to save time, you may wish to provide students with a reproduced graph for Exercise 3. Note whether the "dots" are placed in the appropriate places first and then broken lines are drawn.

When the graphs are completed, have students interpret the data. Use questions such as: "Which month(s) showed the greatest sales? least sales?" "How could we explain the growth of sales?" "How could we explain the growth of sales after March? the drop in sales after July?" "How would this graph be useful to the Benton Bicycle Shop for next year's sales?"

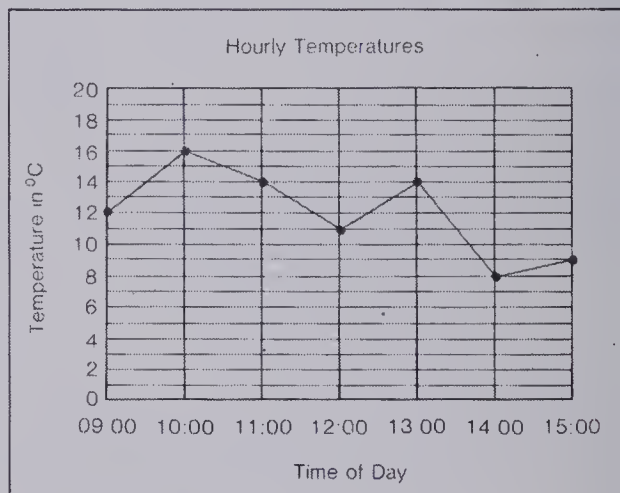
## More Graphs

1. Conduct an experiment about one of these topics. Remember to use the 3 steps on Page 290. Make a graph that best pictures your information.
  - (a) Favourite ice-cream flavour
  - (b) Favourite foods
  - (c) Pets in the home
  - (d) Favourite TV shows
  - (e) Favourite cartoons
  - (f) Number of students with birthdays each month
  - (g) Number of days of rain, cloud, and sun in a month
  - (h) Team standings for hockey, baseball, or soccer

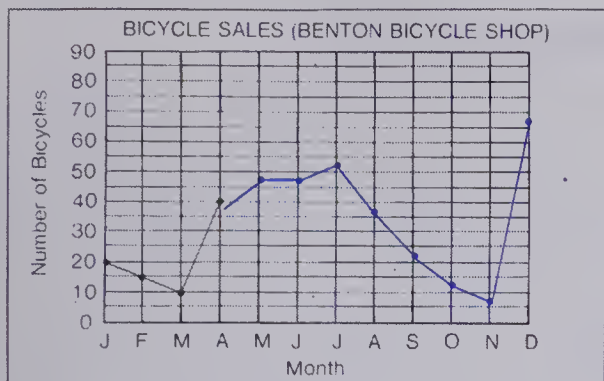


2. Fred and Freda measured the temperature each hour. They constructed a **broken line graph** to picture their information.

Time of Day	°C
09.00	12
10.00	16
11.00	14
12.00	11
13.00	14
14.00	8
15.00	9



Compare this graph to a (a) pictograph (b) bar graph.  
In what ways is it different? similar?



Month	Bicycles Sold
Jan	20
Feb	15
Mar	10
Apr	40
May	50
June	50
July	55
Aug	40
Sept	25
Oct	15
Nov	10
Dec	75

3. Copy and complete this graph using the information in the table.  
(The first 4 months have been done for you!)
4. Conduct one of these experiments. Construct a broken line graph to picture your information.
  - (a) Record the hourly temperature outside your school.
  - (b) Record the highest daily temperature for one week.
  - (c) Record the highest daily temperature for one month.
  - (d) Record the attendance of students in your classroom.
  - (e) Record the average weekly rainfall (or snowfall).
  - (f) Record your test marks over a period of time.

## Tune Up

Estimate by rounding up and rounding down. Calculate.

1.  $52 \times 46$  Between 2000 and 2392
2.  $76 \times 84$  Between 5600 and 6384
3.  $32 \times 48$  Between 1200 and 1536
4.  $56 \times 62$  Between 3000 and 3472
5.  $74 \times 18$  Between 700 and 1332

Divide using short division.

6.  $4 \overline{)685}$  171 R1
7.  $7 \overline{)973}$  139
8.  $6 \overline{)714}$  119
9.  $9 \overline{)1032}$  114 R6
10.  $8 \overline{)6408}$  801

11.  $7 \times 3 + 5 - 6$  20
12.  $8 \div 2 + 4 \times 2$  12
13.  $28 - 6 \times 4 + 5$  9

The Tune Up exercises have been included to provide skill maintenance. The following chart shows where the specific skills were presented in the text.

Exercise	Page
1-5	85
6-10	273
11-13	280-282

## ACTIVITIES

1. Exercise 4 requires the collection of data over a fairly long period of time. Small groups of students could identify the experiment they wish to conduct, then assign responsibilities. For example, John could get the thermometer and put it outside the window and bring it in at the end of the day; Sally could record the hourly temperatures; Freda could start drawing a rough draft of the graph; etc.

2. Data which lends itself to display on a broken line graph can be found in various almanacs. An interested group of students might want to select some data, construct a line graph, and present the results to the rest of the class.

3. Much of the information gathered during the Activities on pages 284 to 286 of the teaching notes will lend itself nicely to graphing.

OBJECTIVE

To evaluate achievement of the chapter objectives

PACING

- Level A All
- Level B All
- Level C All

RELATED AIDS

HMS — DM72.

USING THE BOOK

Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a large number of students had difficulty with a particular topic or concept. The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 264). An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1	A	268-270
2	B	272, 273
3(a)-3(d)	C	274
3(e)-3(h)	D	276, 277
5	E	280-282
6	F	284-286
7	G	292
4	H	various

Chapter Test

1. (a) Show how you would *estimate* the answers for these questions.  

(i) 
$$\begin{array}{r} 275 \quad 300 \\ +423 \quad +400 \\ \hline 698 \quad 700 \end{array}$$

(ii) 
$$\begin{array}{r} 720 \quad 700 \\ -387 \quad -400 \\ \hline 333 \quad 300 \end{array}$$

(iii) 
$$\begin{array}{r} 86 \quad \text{Round down: } 80 \quad \text{Round up: } 90 \\ \times 52 \quad \times 50 \quad \times 60 \\ \hline 4472 \quad 4000 \quad 5400 \end{array}$$

Between 4000 and 5400.
- (b) Find the answer for each question.
2. Use *short division* to find the quotients.  

(a) 
$$\begin{array}{r} 14 \\ 6 \overline{)84} \end{array}$$

(b) 
$$\begin{array}{r} 34 \\ 7 \overline{)238} \end{array}$$

(c) 
$$\begin{array}{r} 127 \\ 4 \overline{)508} \end{array}$$

(d) 
$$\begin{array}{r} 241 \\ 5 \overline{)1205} \end{array}$$
3. Divide.  

(a) 
$$\begin{array}{r} 0.9 \\ 3 \overline{)2.7} \end{array}$$

(b) 
$$\begin{array}{r} 2.8 \\ 4 \overline{)11.2} \end{array}$$

(c) 
$$\begin{array}{r} 1.8 \\ 6 \overline{)10.8} \end{array}$$

(d) 
$$\begin{array}{r} 2.48 \\ 7 \overline{)17.36} \end{array}$$

(e) 
$$\begin{array}{r} 0.7 \\ 23 \overline{)16.1} \end{array}$$

(f) 
$$\begin{array}{r} 3.5 \\ 21 \overline{)73.5} \end{array}$$

(g) 
$$\begin{array}{r} 4.7 \\ 36 \overline{)169.2} \end{array}$$

(h) 
$$\begin{array}{r} 2.09 \\ 26 \overline{)54.34} \end{array}$$
4. Solve.  

(a) 174 empty pop bottles.  
6 bottles in every case.  
How many cases? **29**

(b) 25 2 m of sailing rope.  
It is cut into 4 equal pieces.  
What is the length of each piece? **6.3 m**
5. Perform the operations  

(a)  $(6 + 8) \div 2$  **7**

(b)  $18 - 2 \times 5$  **8**

(c)  $24 - (3 \times 4)$  **2**

(d)  $5 \times 8 + 2$  **42**

(e)  $6 \times 5 + 5 \times 3$  **45**

(f)  $32 - (3 + 1) - 4$  **4**
6. Find the average of each set of numbers  

(a) 21, 25, 19, 23 **22**

(b) 14.2, 13.1, 16.5 **14.6**

(c) 83, 90, 79, 85, 83 **84**
7. Construct a line graph to show the information in this table

Highest Weekly Temperatures for July

Week	Temperature
first	26
second	21
third	27
fourth	32
fifth	28



## Cumulative Review

1. Calculate.

$$\begin{array}{r} 4629 \\ -1708 \\ \hline 2921 \end{array}$$

$$\begin{array}{r} 50.16 \\ -37.24 \\ \hline 12.92 \end{array}$$

$$\begin{array}{r} 238 \\ \times 41 \\ \hline 9758 \end{array}$$

$$\begin{array}{r} 207 \\ 5 \overline{)1035} \end{array}$$

2. Write the following as products of their prime factors.

(a) 24  $2 \times 2 \times 2 \times 3$

(b) 45  $3 \times 3 \times 5$

(c) 39  $3 \times 13$

3. Write the greatest common factor of each pair of numbers.

(a) 3, 21  $3$

(b) 5, 10  $5$

(c) 27, 18  $9$

4. Write the least common multiple of each pair of numbers.

(a) 4, 8  $8$

(b) 3, 7  $21$

(c) 4, 6  $12$

5. Express each as a decimal.

(a)  $\frac{1}{4}$   $0.25$

(b)  $\frac{7}{10}$   $0.7$

(c) 65%  $0.65$

(d)  $\frac{2}{5}$   $0.4$

6. Express each as a fraction.

(a) 37%  $\frac{37}{100}$

(b) 0.43  $\frac{43}{100}$

(c) 1.7  $1\frac{7}{10}$

(d) 0.2  $\frac{2}{10}$  or  $\frac{1}{5}$

7. Express each as a percent.

(a)  $\frac{3}{10}$   $30\%$

(b) 0.45  $45\%$

(c)  $\frac{1}{4}$   $25\%$

(d)  $\frac{9}{20}$   $45\%$

8. Calculate.

(a) 10% of 42  $4.2$

(b) 90% of 35  $31.5$

9. Add.

(a)  $\frac{8}{10} + \frac{5}{10}$   $\frac{13}{10}$  or  $1\frac{3}{10}$

(b)  $\frac{3}{4}$

(c)  $2\frac{2}{5}$

$$\begin{array}{r} \frac{3}{4} \\ + \frac{1}{8} \\ \hline \frac{7}{8} \end{array}$$

$$\begin{array}{r} 2\frac{2}{5} \\ + 6\frac{1}{5} \\ \hline 8\frac{3}{5} \end{array}$$

10. Subtract.

(a)  $\frac{6}{8} - \frac{1}{8}$   $\frac{5}{8}$

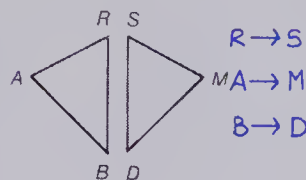
(b)  $\frac{7}{8}$

(c)  $7\frac{3}{4}$

$$\begin{array}{r} \frac{7}{8} \\ - \frac{5}{12} \\ \hline \frac{11}{24} \end{array}$$

$$\begin{array}{r} 7\frac{3}{4} \\ - 2\frac{1}{4} \\ \hline 5\frac{2}{4} \text{ or } 5\frac{1}{2} \end{array}$$

11. These two triangles are congruent. Name the matching vertices.



## OBJECTIVE

To review and test selected concepts and skills previously covered

## PACING

Level A All

Level B All

Level C All

## USING THE BOOK

This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a large number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic or, refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

### Test Item | Text Page Number

1(a)	3
1(b)	12
1(c)	86
1(d)	142
2	214
3	217
4	221
5	236, 258
6, 7	257
8	259
9(a), 10(a)	233
9(b)	246
10(b)	247
9(c), 10(c)	250
11	54

# CHAPTER 10 OVERVIEW

The transformations of slides, flips, turns, and enlargements are developed further by discussing congruence and corresponding parts of the patterns. Symmetry is discussed also. Tessellations are explored through activities. The whole chapter is developed for a hands-on involvement by the students. This chapter might be integrated with some art experiences.

## OBJECTIVES

- A To identify and draw slide images of a shape
- B To identify and draw turn images of a shape
- C To identify and draw flip images of a shape
- D To draw an enlargement
- E To identify the line of symmetry on a symmetric shape
- F To use congruent shapes for tiling and to identify matching vertices and sides of congruent shapes

## BACKGROUND

While we use the terms slides, flips, and turns, the geometric terms are translations, reflections, and rotations. These three transformations are isometric which means that the images and objects in each are congruent (i.e., the size and shape of an object is not changed in the image). An enlargement is called a dilatation. Many of the patterns formed in modern wall and floor coverings have a transformational basis. As well, special and valuable qualities of certain polygons centre on the number of lines of symmetry each has.

## MATERIALS

paper	dot paper
scissors	semi-transparent mirrors
paints	2 cm grid paper
crayons	4 cm grid paper
geo-boards	boxes with lids
elastic bands	0.5 cm grid paper

## CAREER AWARENESS

### Physical Therapist [318]

Physical therapists help people who have injuries or certain diseases by providing treatments usually involving activities such as exercise, stimulation through heat, light and/or massage. They must have an in-depth knowledge of bone and muscle structure, tendon and ligament function, the nervous system, and how all of these components work together to enable people to use their limbs. They must be well aware, not just of the treatment process, but also of retraining techniques as well. They are often involved in helping patients "relearn" a skill such as walking, bending, or lifting that was previously taken for granted.

Many professional sports teams use the services of physical therapists to help their injured athletes get back into form more quickly and completely.

Many physical therapists work in hospitals, but sometimes they work in clinics or special offices. To be a physical therapist, one must have a license. A license is obtained only after extensive training in special schools or universities for three to four years. Physical therapists need more than a normal share of kindness, patience, and understanding.

## Line Symmetry

Fold a piece of paper.



Cut a pattern.



Open.



Line of symmetry

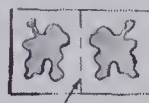
Put paint on paper.



Fold and press.



Open.



Line of symmetry

### Exercises

1. Make designs using the two methods shown above.



2. Fold paper and cut a pattern that looks like this. Open.

This is called a **kite**.

- (a) How many sides does a kite have? **4**

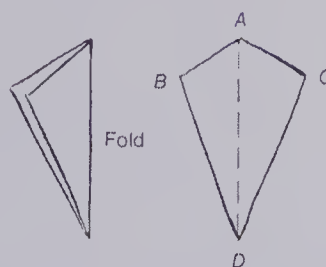
- (b) Measure sides  $AB$  and  $AC$  on your kite.

What do you notice? **They are congruent.**

- (c) Measure sides  $BD$  and  $CD$ . What do you notice? **They are congruent.**

- (d) How many pairs of equal sides does a kite have? **2**

- (e) How many lines of symmetry does a kite have? **1**



3. Put a paint spot on paper.

Fold and press. Open.

Mark the line of symmetry.

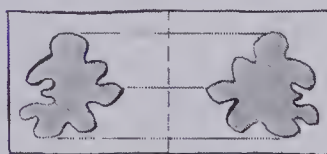
Pick a point on one half.

Draw a line to its match in the other half.

Do this for two other points.

What do you notice about these lines?

**Matching points are the same distance from the fold line (line of symmetry).**



Symmetry 297

## OBJECTIVE

To create symmetric shapes by folding and cutting, and paint spots

## PACING

Level A All

Level B All

Level C All

## VOCABULARY

line symmetry

## MATERIALS

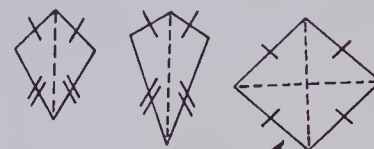
paper, scissors, paint

## BACKGROUND

A major concept in geometry is one of correspondence (i.e., corresponding points on symmetric shapes and on congruent shapes).

A kite is a shape with at least 1 line of symmetry and 2 pairs of equal sides. All sides may be equal, but this is not necessary.

Kites



This one is also a rhombus.

## USING THE BOOK

Students will readily follow the activities on this page. Illustrate and take the students through the practice exercises shown in each of the display panels. Then let the students do several others on their own.

In Exercise 2, discuss the properties of a kite.

In Exercise 3, discuss the way to identify matching points. Refer to some of the shapes made in Exercise 1. Note that the line segments joining corresponding points are (a) parallel, and (b) cut in half by the line of symmetry.

## ACTIVITIES

1. Encourage the students to cut out and name symmetric creations. They may wish to colour the cutouts. After they have coloured them, discuss whether or not the shapes are still symmetric (i.e., the shapes are but are the colouring patterns?). Challenge the students to colour so that symmetry is maintained.

2. Have students arrange a

bulletin-board display on line symmetry. Ask students to bring pictures from magazines. The line of symmetry should be drawn on each picture.

3. The students might enjoy making "symmetry paintings". Have them use the folding method to paint pictures depicting reflections (i.e., trees reflected in lakes, faces in mirrors, and so on).



## OBJECTIVES

To make a flip pattern on a geo-board  
To draw a flip pattern on dot paper  
(geo-paper)

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

geo-boards, elastic bands, dot paper

## BACKGROUND

In making flip patterns, we use the concept of corresponding vertices being equidistant from the line of symmetry. Flip patterns form two congruent shapes. Two shapes are congruent if they are the same size and shape.

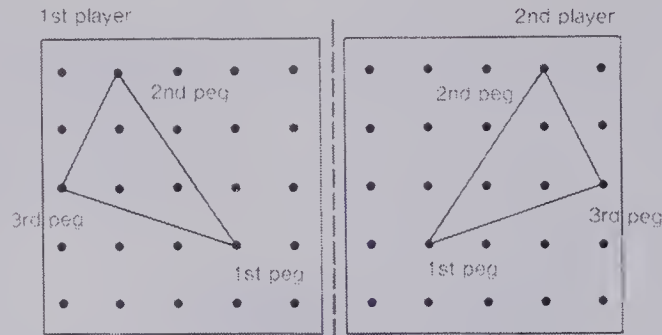
## USING THE BOOK

If geo-boards are not available, do page 298 on dot paper. As illustrated in the pupil display, have the first student make a shape on a board (or on dot paper). Then have the second student place his or her board next to the first board. Have the second student make the flip pattern. Stress informality. In the display, the 1st peg is 2 units from the line of symmetry; therefore, the 1st peg of the second shape must be 2 units from the line of symmetry. Then repeat for each peg. Let the students play the game as indicated in Exercise 1. In Exercise 2, have the students work independently. Ask the students to work in pairs to check each other's work.

On page 299 in Exercises 1 and 2, have the students work independently on geo-paper or dot paper. Students working in pairs can check each other's work. Discuss the answers to the questions. Emphasize that (a) a point and its matching point are the same distance from the line of symmetry, and (b) each pair of shapes are congruent. In Exercises 1 and 2, the students can check their own work by folding the paper on the line of symmetry and placing the folded paper on a window to see if the two shapes match.

## Flip Images

Work in pairs. Use geo-boards.

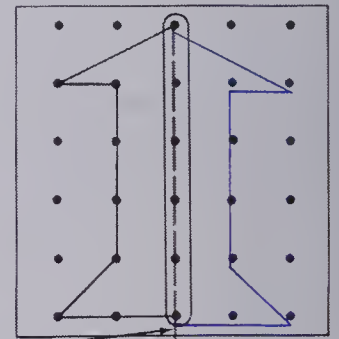
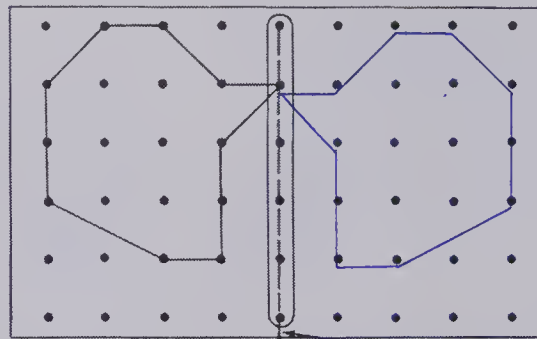


To play:

The first player makes a shape on the geo-board.  
The second player must make the flip image of the shape.

### Exercises

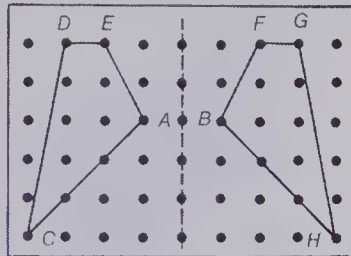
1. Play the game above in pairs. Take turns making the first pattern. A point is won for each correct image.
2. Make each pattern on your geo-board. Then make the flip pattern.



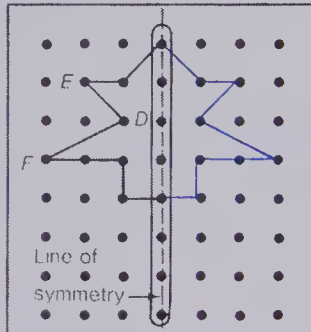
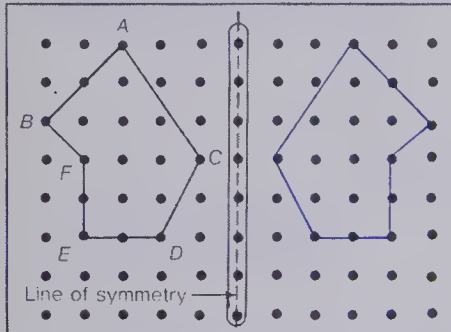
Line of symmetry

## More Flip Images

- Use dot paper.  
Make a pattern on the left side.  
Draw a line of symmetry.  
Draw the flip image on the right side.  
Point *B* matches point *A*. *G H F*  
What point matches point *D*? *C*? *E*?



- (a) Use dot paper.  
Copy each pattern.  
Make the flip image of each.



Each point and its matching point are the same distance from the line of symmetry.

- How far is each point and its matching point from the line of symmetry?

A B C D E F

## BRAINTICKLER

Solitaire.

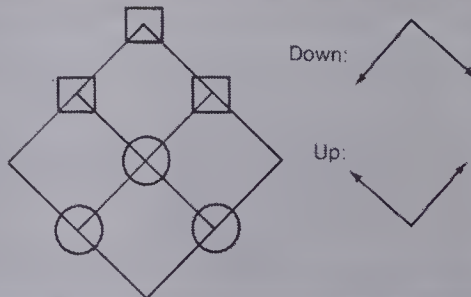
Trace the grid pattern.

Place square and circular markers as shown.

Squares move down only.

Circles move up only.

To win: Get the squares where the circles are and the circles where the squares are.



## ACTIVITIES

1. Have the students play the game in Exercise 1, page 298, with these variations:

- there are to be exactly 4 vertices in the shape,
- there are to be exactly 5 vertices in the shape.

2. Provide a challenge such as the following. These numbers are palindromes. They read the same forwards as backwards: 3553, 44 (they are, in a sense, flip images). You can form palindromes by adding a number and its reverse. You may have to reverse and add more than once.

Example

$$\begin{array}{r} 48 \\ + 84 \\ \hline 132 \\ + 231 \\ \hline 363 \end{array}$$

Choose any 2-digit number. Form a palindrome. Are there any numbers which do not form palindromes? [No, though some numbers must be reversed and added many, many times, e.g., 97.]

## OBJECTIVES

To use a semi-transparent mirror to draw flip patterns

To review basic computational skills

## PACING

Level A Mirrors — All; Tune Up — All

Level B Mirrors — All; Tune Up —  
Odd-numbered exercises

Level C Mirrors — All; Tune Up —  
Optional

## VOCABULARY

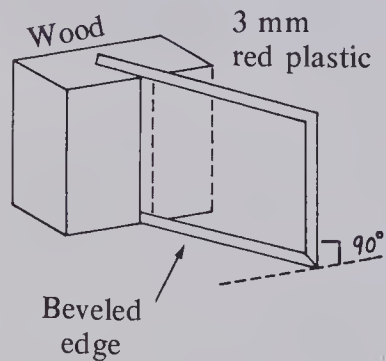
transparent

## MATERIALS

semi-transparent mirrors

## SUGGESTIONS

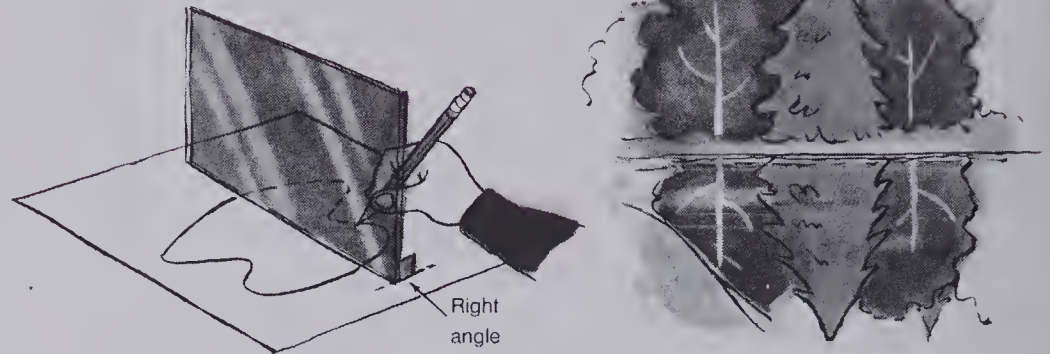
**Initial Activity** Commercial products are available; however, red plastic held in a block of wood at a right angle to the paper can be made easily. The plastic *must* be held at a right angle to the page.



Provide students with the semi-transparent mirrors and let them explore the various aspects of it and what it does. Discuss the beveled edge and the fact that it should always be facing the user.

## Mirrors

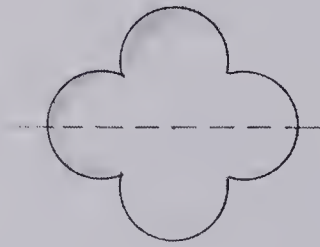
We can use a transparent plastic mirror to draw flips.



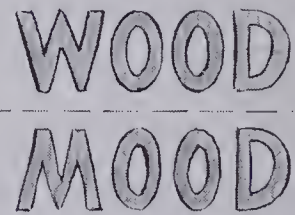
### Exercises

1. Place a transparent plastic mirror on the line of symmetry. Match the patterns.

(a)



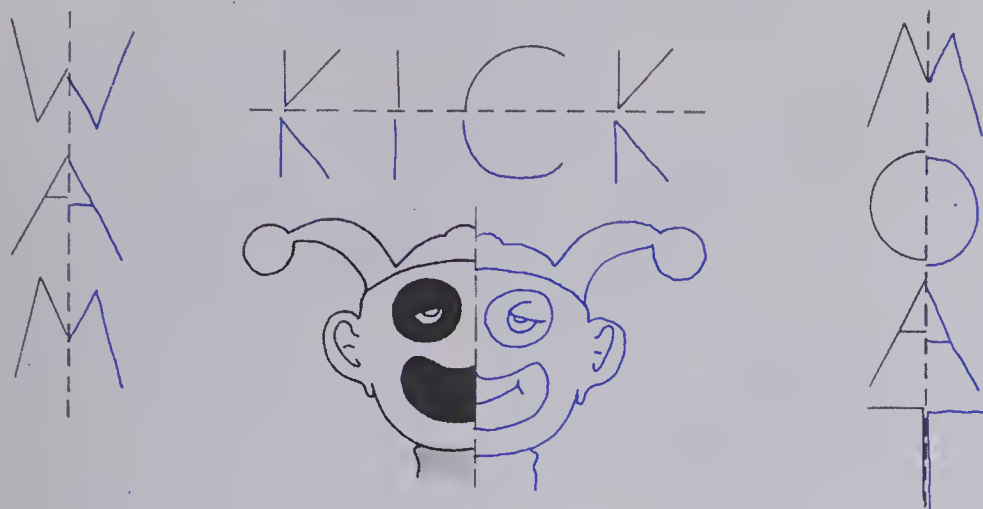
(b)



2. Trace each shape. Use a transparent mirror to complete the mirror pattern.







## Tune Up

Add.

1.  $23.4 + 4.569 + 632.5$  **660.469**

2.  $356.1 + 0.374 + 6.28$  **362.754**

Subtract.

3.  $324.5 - 16.2$  **308.3**

4.  $62.456 - 8.39$  **54.066**

Add.

5.  $\frac{2}{5} + \frac{1}{10}$   **$\frac{5}{10}$  or  $\frac{1}{2}$**

6.  $\frac{1}{2} + \frac{1}{4}$   **$\frac{3}{4}$**

Subtract.

7.  $\frac{7}{10} - \frac{1}{2}$   **$\frac{2}{10}$  or  $\frac{1}{5}$**

8.  $\frac{3}{4} - \frac{1}{2}$   **$\frac{1}{4}$**

Complete.

9.  $\frac{1}{5} = \frac{\blacksquare}{10}$  **2**

10.  $\frac{1}{3} = \frac{\blacksquare}{12}$  **4**

11.  $\frac{1}{4} = \frac{\blacksquare}{20}$  **5**

12.  $\frac{2}{5} = \frac{\blacksquare}{15}$  **6**

Multiply.

13.  $234 \times 56$  **13104**

14.  $256.3 \times 1.8$  **461.34**

Divide.

15.  $23 \overline{)456}$  **19.819**

16.  $36 \overline{)3456}$  **96**

Change to a decimal.

17. 50% **0.5**

18. 75% **0.75**

Find.

19. 20% of 80 **16**

20. 60% of 50 **30**

Flips, practice 301

## USING THE BOOK

Following the display at the top of the pupil page, ask the students to draw a shape on a page. Have the students use plastic mirrors to draw the flip by looking in the mirror, reaching behind, and tracing the shape seen there. Repeat with several other shapes. While completing Exercises 1 and 2, discuss what the students are doing by eliciting what each sees and draws.

The Tune Up exercises have been included to provide practice in various arithmetic skills. If some students experience difficulties, you may wish to provide remediation. The following chart shows where the various topics were presented in the text.

Exercise	Page
1-4	7, 16
5, 6	246
7, 8	247
9-12	240
13	86
14	94
15	145
16	139, 141
17, 18	258
19, 20	259

## ACTIVITIES

1. Repeat the display by having each student draw a shape on a page. Then ask the students to exchange pages. Each is to make the flip pattern.

2. Have the students make patterns which are words when flipped as in Exercise 1(b).

3. Have the students make patterns which are words when completed by a flip as in Exercise 2.

OBJECTIVE

To draw the lines of symmetry on polygons

PACING

- Level A All
- Level B All
- Level C All

MATERIALS

semi-transparent mirrors

BACKGROUND

The number of lines of symmetry, along with the number of sides, helps to define and identify a polygon.

Number of lines of symmetry of a rectangle, 2; square, 4; isosceles triangle, 1; equilateral triangle, 3; scalene triangle, 0; parallelogram, 0; rhombus, 2; kite, 1.

USING THE BOOK

Ask the students to trace the shapes. Have them draw the lines of symmetry directly on the shapes.

ACTIVITIES

1. Provide students with a set of polygons cut from cardboard. Students are to trace each and mark the lines of symmetry on their tracings.

2. Direct the students to copy and complete this chart for the shapes they have used in this lesson.

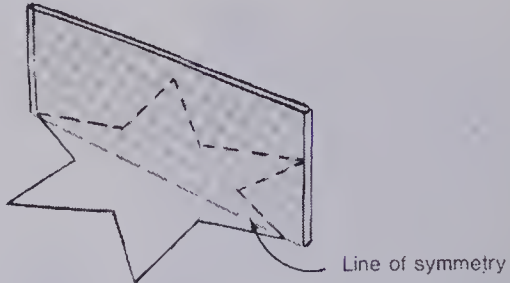
Shape	Number of of Sides	Number of Lines of Symmetry
Isosceles triangle	3	1

3. Prepare or ask students to prepare Puzzle Cards similar to this.

I have 4 sides.  
I have 4 lines of symmetry.  
Who am I?

Lines of Symmetry

We can use a transparent mirror to draw all the lines of symmetry on certain shapes.



Exercises

Trace each shape. Use a transparent mirror to draw the lines of symmetry. Some shapes have more than one and some have none.

1.

2.

3.

4.

5.

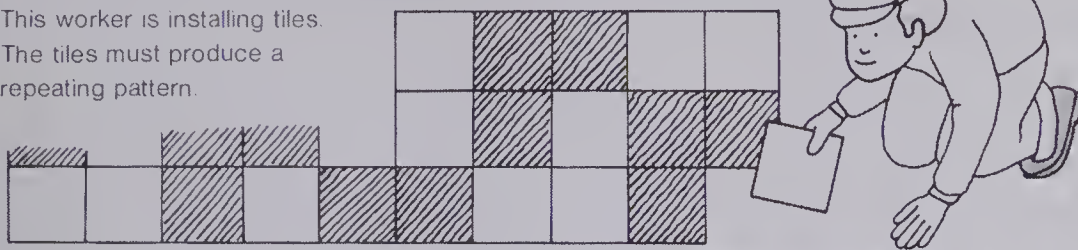
6.

7.

8.

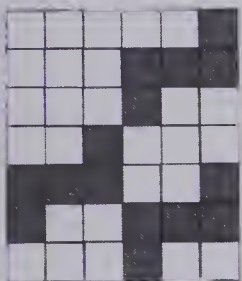
# The Flooring Contractor

This worker is installing tiles.  
The tiles must produce a repeating pattern.



## Exercises

1. Draw this pattern in the middle of a  $12 \times 12$  square grid. Complete the grid using this pattern throughout.
2. Repeat Exercise 1 using this pattern.



4. Sergio helped a customer find the cost of tiles for a new floor. Sergio knew that 35 cartons of tiles were needed. Each carton cost \$32.58. How much would all the tiles cost? **\$1140.30**
5. Agnes was trying to find the cost of tiles for an office. The office was rectangular in shape and was 9 m by 11 m. Each carton of tiles covered four square metres. How many cartons should Agnes order? **25**



3. Make up a small pattern similar to that in Exercise 1. Give it to a classmate to use to tile a  $12 \times 12$  grid.

Repeating patterns, problem solving 303

## OBJECTIVE

To solve word problems involving area and pattern building

## PACING

Level A 1-3  
Level B All  
Level C All

## VOCABULARY

contractor, customer, rectangular

## MATERIALS

2 cm grid paper

## SUGGESTIONS

**Initial Activity** Review the concept of repeating patterns by providing several examples such as: 1 2 3 1 2 3 1 2 3...;  $\square \triangle \square \triangle \square \triangle \dots$ ; 1 A 2 B 3 C 4 D.... Have them completed by student volunteers being certain to clarify for all, the pattern in each. Use large graph paper (or an overhead projector) to provide several examples of *graphic* patterns as exemplified at the top of the pupil page. Have these completed also, noting the specifics of each (shape, spacing, colour). You may wish to provide a blank grid and have a volunteer start a pattern that will be completed, before turning to the pupil books.

## USING THE BOOK

Read aloud the instructions in the exercises. The students should be able to proceed on their own.

## ACTIVITIES

1. If you have not already done so, see the Activities listed with the calculation of area topics on teaching note pages 153 to 155.

2. Some students might enjoy a challenge such as this. Make three  $3 \times 3$  squares. Arrange the digits 1 through 9 so that the sum of the numbers in the first and second row is equal to the number in the third row. One arrangement is shown.

3	2	7
6	5	4
9	8	1

Other solutions are:

273	218	235	318	215
546	439	746	654	748
819	657	981	972	963
317	154	341	243	216
628	782	586	675	738
945	936	927	918	954

3. Have the students use graph paper or squared paper to create patterns for display on a bulletin board.



## OBJECTIVE

To complete one half of a symmetric shape

## PACING

Level A 1-6, 10-13

Level B 4-13

Level C 4-13

## VOCABULARY

symmetric

## MATERIALS

dot paper

## RELATED AIDS

HMS — DM73 and DM74.

## SUGGESTIONS

**Initial Activity** Use the overhead projector and illustrate completing a symmetric shape similar to that in the pupil display. Fold the transparency to show that the two halves match.

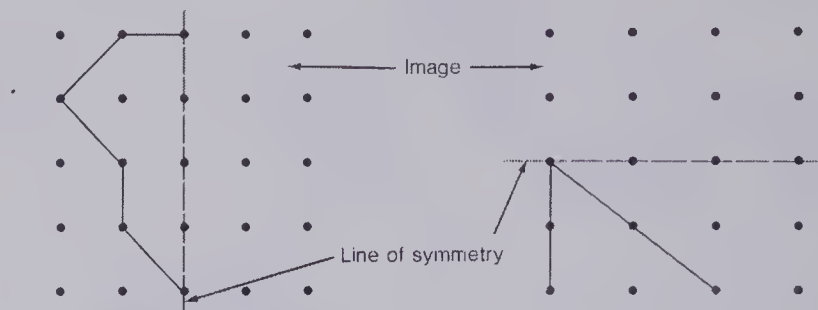
## USING THE BOOK

Discuss the display and how each pattern was completed by a flip.

For Exercises 1 to 9, have classmates check each other's work. For Exercises 10-12, discuss with the students which letters of the alphabet are symmetric. You may wish to compose a list for their use.

## Completing Symmetric Shapes

Each symmetric shape has been completed.

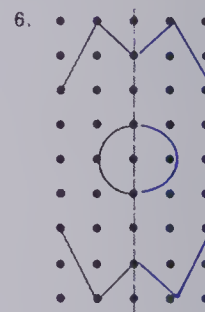
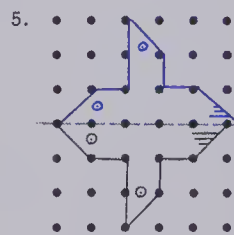
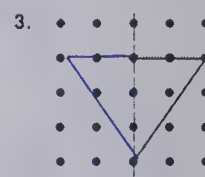
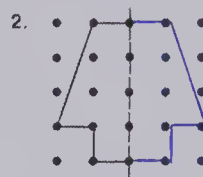
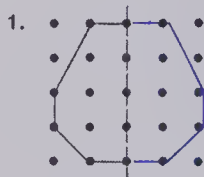


### Exercises

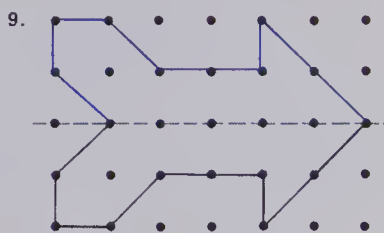
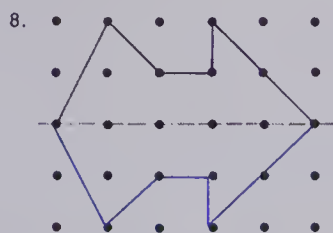
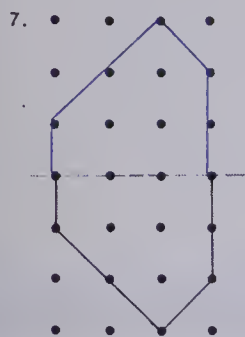
Copy each on dot paper.

Complete the other half to make a symmetrical shape.

Check each by using a transparent mirror.



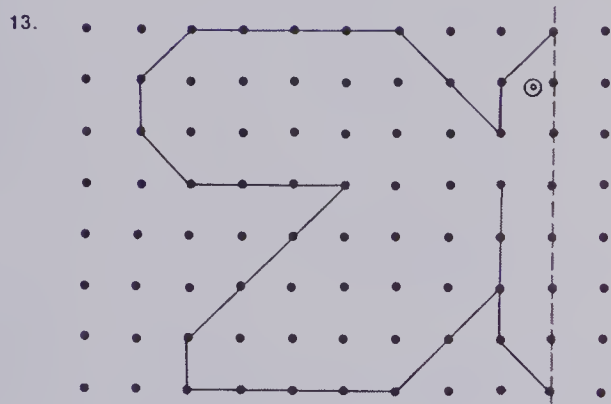
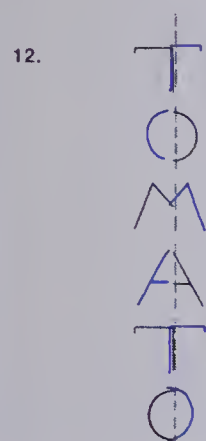
Copy and complete the other half to make a symmetrical shape.  
Check using a transparent mirror.



10. Make words for your friends to complete by flips.

Trace these.

Complete by drawing the flip images.



Completing symmetric shapes 305

## ACTIVITIES

1. Ask the students to identify the letters of the alphabet and the numerals which can be flipped to be completed or have a line of symmetry.

2. Challenge students to make up puzzle words for their friends as in Exercises 11 and 12.

3. Make up this activity card for students to do in their spare time. Plasticize the card so that students can use a water soluble felt pen. Put the answers on the reverse side.

Complete the blanks; analogies.

*Example*

A square is to 4 as a pentagon is to \_\_\_\_\_. [5]

1. Addition is to sum as multiplication is to \_\_\_\_\_. [product]

2. A penny is to a dollar as a centimetre is to a \_\_\_\_\_. [metre]

3. January is to 31 as April is to \_\_\_\_\_. [30]

4. 16 is to  $4 \times 4$  as 49 is to \_\_\_\_\_. [ $7 \times 7$ ]

5. 8 is to composite as 7 is to \_\_\_\_\_. [prime]

6. IV is to 4 as CM is to \_\_\_\_\_. [900]

7. A tenth is to 0.1 as a thousandth is to \_\_\_\_\_. [0.001]

8. 21 is to odd as 22 is to \_\_\_\_\_. [even]

9. A decade is to 10 as a century is to \_\_\_\_\_. [100]

10. 7 is to week as 365 is to \_\_\_\_\_. [year]

## OBJECTIVES

To make a slide pattern on a geo-board  
or on dot paper

To develop the concept of  
correspondence and congruence

## PACING

Level A 1-5

Level B All

Level C 1, 2, 4-7

## VOCABULARY

congruent

## MATERIALS

geo-boards, elastic bands, dot paper

## BACKGROUND

Two shapes are congruent if one is the slide pattern of the other.

## SUGGESTIONS

**Initial Activity** Using a polygon, illustrate the basic idea of a slide by tracing it on the chalkboard or overhead projector and then sliding it and tracing it again. Discuss what a slide is and what it is not (i.e., it is *not* turned nor flipped). You may wish to review the work presented on pages 52 and 54.

## USING THE BOOK

If geo-boards are not available, do this section on dot paper (geo-paper).

Illustrate the procedure indicated by the pupil display. Note the matching vertices:  $A'$  is 6 units to the right of vertex  $A$ ;  $B'$  is 6 units to the right of vertex  $B$ ;  $C'$  is 6 units to the right of vertex  $C$ . By emphasizing that each vertex is moved exactly the same amount in the same direction, we develop intuitively a property of a slide.

Some students may need to make a cutout of the first shape in order to locate the second shape. Emphasize that the two shapes in a slide are the same size and shape, and hence, they are *congruent*.

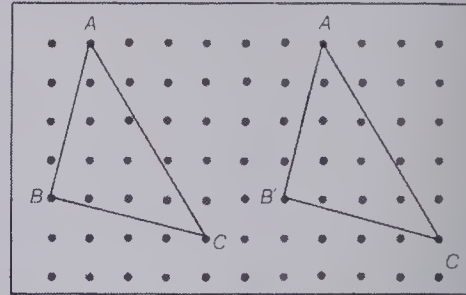
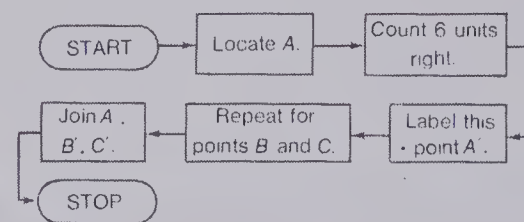
Assign Exercises 1 to 3. Have classmates check each other's work.

Move about the class checking each student's work. Ask students to tell you what they are doing, step by step. This helps the student to identify properties of slides.

Exercises 4 to 6 involve moving the shape in two directions. Do Exercise 4 together with a group. Then assign the other two exercises. Have students check each other's work.

## Slides

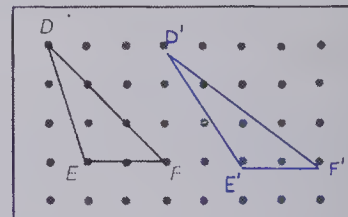
Slide  $\triangle ABC$  right 6 units.



**A figure and its slide image are congruent.**

## Exercises

1. Copy this triangle on dot paper.
  - (a) Slide  $\triangle DEF$  4 units right.
  - (b) Name the image  $\triangle D'E'F'$ .
  - (c) Exchange with a classmate to check the slide.



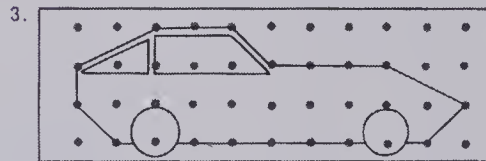
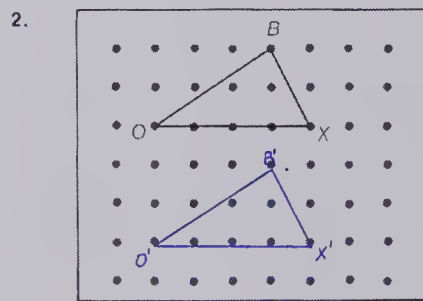
Copy this triangle on dot paper.

Slide the triangle 3 units down.

Label the image B'O'X'.

Exchange to check.

Is  $\triangle BOX$  congruent to  $\triangle B'O'X'$ ? **Yes**



Make this car on dot paper.

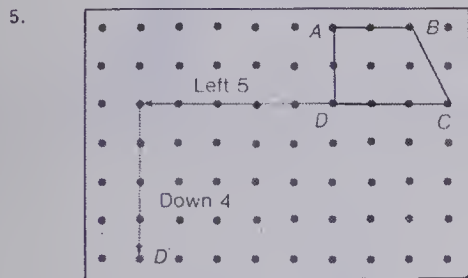
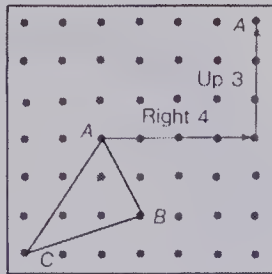
Slide the car 10 units right.

Is the new car congruent to the original car?

Yes



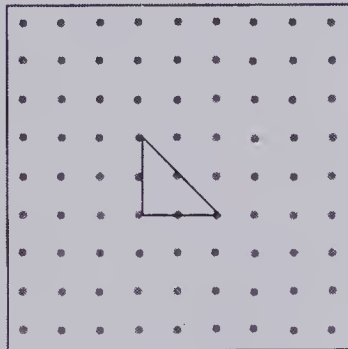
4. We can slide a triangle right and then up.  
Slide  $\triangle ABC$  right 4 units and up 3 units.  
Copy on dot paper and complete the slide.



Slide  $ABCD$  left 5 units and down 4 units.

6. Place a triangle in the middle of your dot paper.  
Draw each slide on the same sheet.
- Right 3, up 2. Colour it red.
  - Left 3, down 3. Colour it blue.
  - Left 3, up 1. Colour it yellow.
  - Right 2, down 2. Colour it green.

*Hint*  
Start from the original triangle each time



- ★ 7. Design a shape in the middle of a sheet of dot paper.  
Make 4 slide images.  
Write slide directions for each slide.

## ACTIVITIES

1. Students, working in pairs, take turns drawing a shape on dot paper with the other drawing the slide identified, e.g., 2 right, 3 down.

2. See the Activities listed on pages 52 and 54 of the teaching notes.

3. The students might enjoy a challenge such as this. Copy and guess what the next five questions and answers will be. Check your guesses by working each (or use a calculator).

$$(1 \times 9) + 2 = 11$$

$$(12 \times 9) + 3 = 111$$

$$(123 \times 9) + 4 = 1111$$

4. Copy and guess what the next three questions and answers will be for this pattern. Check your guesses by working each (or use a calculator).

$$(9 \times 9) + 7 = 88$$

$$(98 \times 9) + 6 = 888$$

$$(987 \times 9) + 5 = 8888$$

OBJECTIVE

To make turn patterns using cutouts

PACING

- Level A All
- Level B All
- Level C All

MATERIALS

paper and scissors

RELATED AIDS

HMS — DM75.

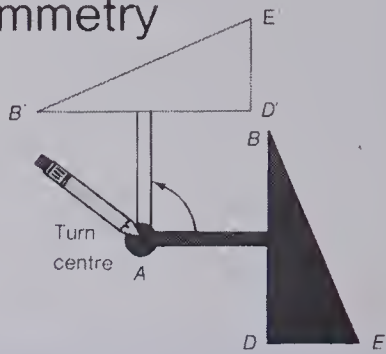
BACKGROUND

Two shapes are congruent if one is the turn pattern of the other. Note that the rotations or turns are made counter-clockwise in the same way we measure angles in coordinate geometry.

A square fits on itself by a rotation in four ways. A rectangle fits on itself by a rotation in two ways. A rhombus fits on itself by a rotation in two ways. An equilateral triangle fits on itself by a rotation in three ways.

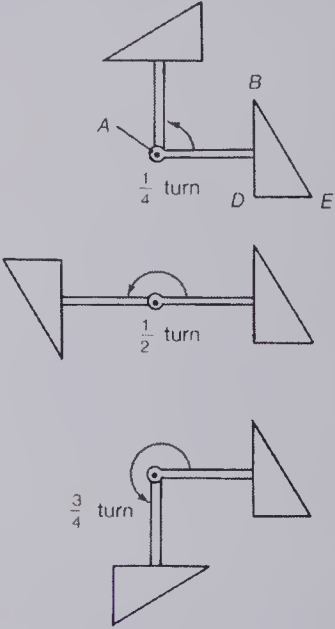
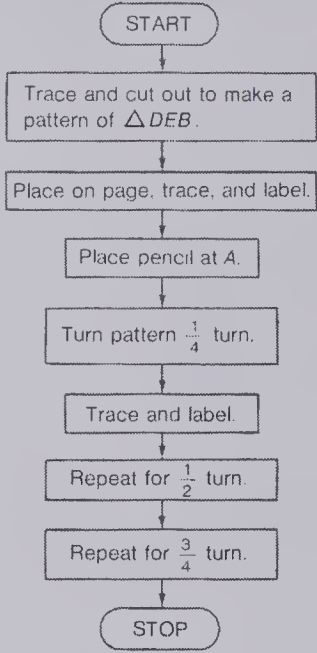
Rotational Symmetry

Toni made the red cutout.  
He placed a pencil at A.  
He turned the cutout  $\frac{1}{4}$  turn.  
 $\triangle DEB$  is congruent to  $\triangle D'E'B'$ .



Exercises

1.

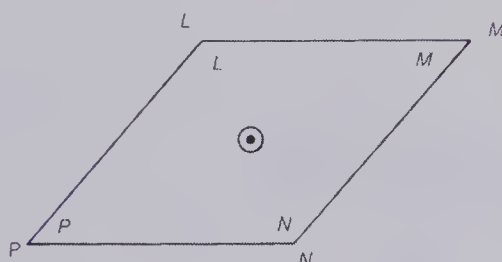
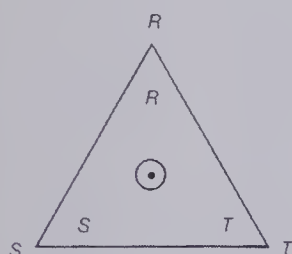
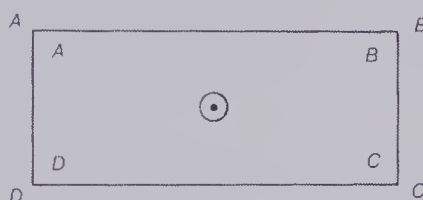
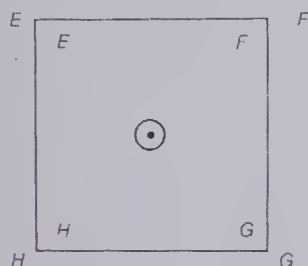


The complete pattern shows rotational symmetry.

2. Use a tracing of "Somersault Jack".  
Repeat the steps in Exercise 1.  
Colour the patterns.



3. Trace and make a cutout of the square  $EHGF$ . Place it on the shape on this page.  
Put your pencil on the turn centre.  
(a) In one full turn, how many times does it match the original shape? **4**  
(b) Repeat the exercise for the rectangle<sup>2</sup>, the triangle<sup>3</sup>, and the rhombus<sup>2</sup>.



4. Which shapes match their own outlines  
(a) twice in a full turn? **Rectangle and rhombus**  
(b) three times in a full turn? **Triangle (equilateral)**  
(c) four times in a full turn? **Square**

## USING THE BOOK

Refer to the pupil display on page 308.  
Have the students do what Toni did:  
(a) trace  $\triangle DEB$  with the stem and cut out, (b) place on page and trace, (c) make  $\frac{1}{4}$  turn and trace again.

For Exercise 1, ask the students to follow the flow chart. Discuss rotational symmetry informally. Do not define rotational symmetry at this point.

In Exercises 2 and 3, let the students enjoy making patterns with the shapes given. Encourage them to colour their patterns. Elicit the word "congruent" with respect to the shapes formed in each pattern. Elicit the idea of corresponding points also.

In Exercise 4, one way of defining squares, rectangles, and rhombuses is illustrated. Do not formalize the definitions but rather discuss the answers to the questions thoroughly.

## ACTIVITIES

- Have the students make their own shapes to form turn patterns.
- Ask the students to identify the letters of the alphabet and the numerals which can be turned to be completed or have rotational symmetry.
- Have the students draw  $\frac{1}{4}$ ,  $\frac{1}{2}$ , and  $\frac{3}{4}$  turns using these shapes. Discuss rotational symmetry.





OBJECTIVES

To identify congruent shapes  
To review and maintain the skills of multiplication and division by powers of 10

PACING

Level A All  
Level B All  
Level C All; Tune Up — Optional

MATERIALS

odd-shaped boxes with lids


BACKGROUND

Two shapes are congruent if one can be moved to fit exactly on the other.


SUGGESTIONS

**Initial Activity** Prepare a demonstration-sized odd shape on the chalkboard and three demonstration-sized paper cutout shapes that will perfectly match by (a) a slide, (b) a flip, and (c) a turn and a slide.


Chalkboard shape




Cover 1

  
(Slide)

Cover 2

  
(Flip)

Cover 3

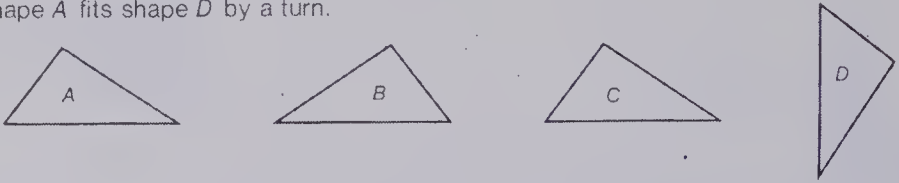
  
(Turn and slide)

Have the students tell which move(s) is (are) necessary for each cover. Allow each student to test each guess.

Matching Shapes

Leo is matching shape A with each shape on the right.

Shape A fits shape B by a flip.  
Shape A fits shape C by a slide.  
Shape A fits shape D by a turn.

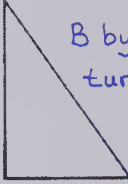


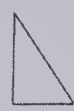
Use cutouts to check.

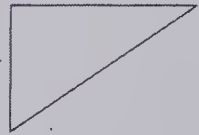
Exercises

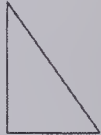
Which shape does the first one match?  
Do you need to slide, flip, or turn to make each fit?

1.

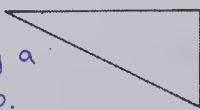
  
B by a turn.

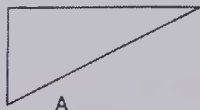
  
A

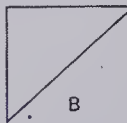
  
B

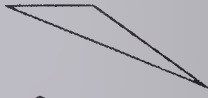
  
C

2.

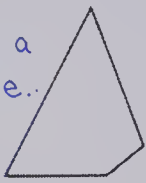
  
A by a flip.


  
A


  
B


  
C

3.

  
C by a slide.

  
A

  
B

  
C

Trace the first shape. Cut it out.

Tell whether a slide, turn, or flip of the cutout is necessary to match each of the others.

4.				
		A	B	C
5.				
		A	B	C
6.				
		A	B	C
7.				
		A	B	C

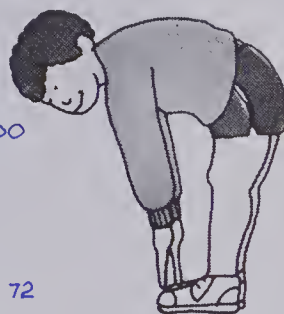
## Tune Up

Multiply.

- |                              |                                |                                   |
|------------------------------|--------------------------------|-----------------------------------|
| 1. $3 \times 10$ <b>30</b>   | 2. $5 \times 100$ <b>500</b>   | 3. $6 \times 1000$ <b>6000</b>    |
| 4. $25 \times 10$ <b>250</b> | 5. $36 \times 100$ <b>3600</b> | 6. $41 \times 1000$ <b>41 000</b> |
| 7. $20 \times 30$ <b>600</b> | 8. $30 \times 40$ <b>1200</b>  | 9. $50 \times 70$ <b>3500</b>     |

Divide.

- |                               |                                   |                                   |
|-------------------------------|-----------------------------------|-----------------------------------|
| 10. $300 \div 10$ <b>30</b>   | 11. $5000 \div 100$ <b>50</b>     | 12. $7000 \div 1000$ <b>7</b>     |
| 13. $2500 \div 10$ <b>250</b> | 14. $56\ 000 \div 100$ <b>560</b> | 15. $72\ 000 \div 1000$ <b>72</b> |
| 16. $400 \div 20$ <b>20</b>   | 17. $800 \div 20$ <b>40</b>       | 18. $2500 \div 50$ <b>50</b>      |



## USING THE BOOK

Some students may need to make a cut-out pattern of the first shape and then move it in order to do these exercises. Encourage this when it is necessary or when it is felt desirable by the student.

**Tune Up.** If students have unusual difficulty with these problems, you may provide appropriate remedial work. The Tune Up Exercises 1 to 9 deal with multiplication of powers of ten (see pages 70, 71, and 84). The Tune Up Exercises 10 to 18 deal with division of and by powers of ten (see pages 107 and 134).

## ACTIVITIES

1. If you have not already done so, see the Activities listed on pages 52 and 54 of the teaching notes.

2. Have the pupils prepare their own "Slide? Flip? Turn?" puzzles as shown in Exercises 1 to 3 using their own shapes.

3. Have the pupils copy and extend this pattern to  $8888 \times 9$ . Guess each product then check by calculating (or use a calculator).

$$2222 \times 9 = 19\ 998$$

$$3333 \times 9 = 29\ 997$$

$$4444 \times 9 = \blacksquare$$

## OBJECTIVE

To make wallpaper patterns using slides, flips, turns, and combinations of these

## PACING

Level A All  
Level B All  
Level C All

## VOCABULARY

patterns

## MATERIALS

paper, scissors, crayons, 4 cm grid paper

## RELATED AIDS

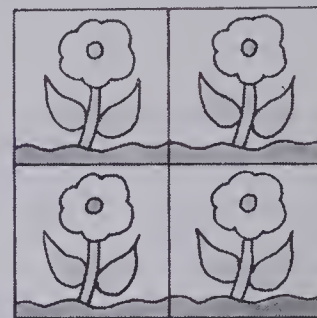
HMS — DM76.

## USING THE BOOK

Illustrate how the various types of wallpaper patterns are made using one basic design. In Exercises 1 to 6, have the students follow the directions using the various basic designs. The students should colour their designs appropriately.

## Making Wallpaper Patterns

We can make wallpaper patterns using slides.

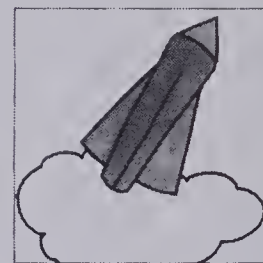
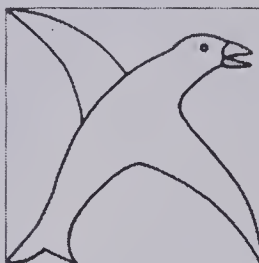
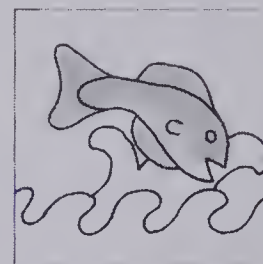
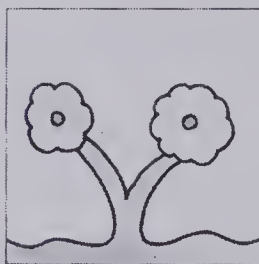


### Exercises

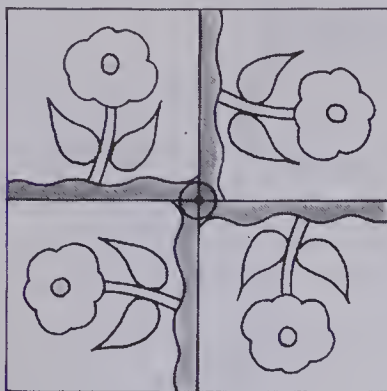
Trace and cut out each shape.

Then use it to make a wallpaper pattern using slides.

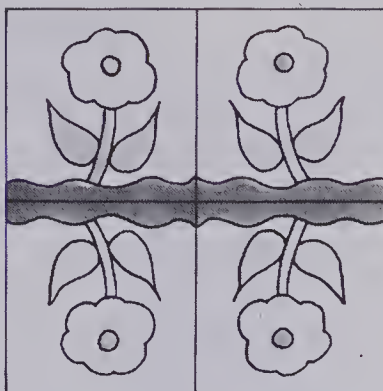
Use grid paper.







We can use turns to make wallpaper patterns.

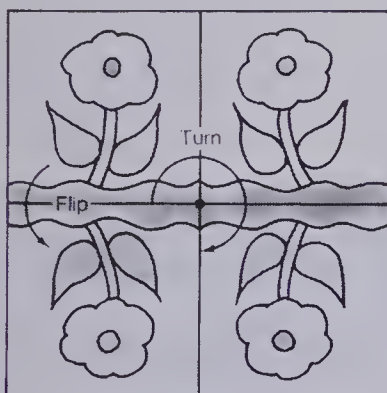


We can use flips to make wallpaper patterns.

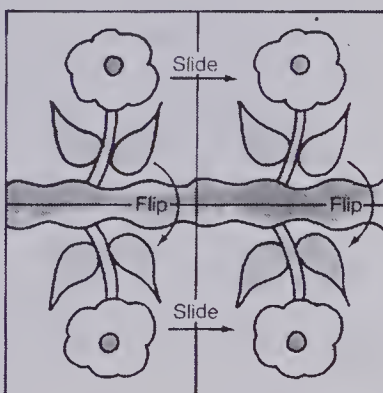
5. Use the shapes on Page 312 to make patterns using

- (a) flips
- (b) turns.

6. We can combine the slides, turns, and flips to make wallpaper patterns.



Make wallpaper patterns using combinations.



## ACTIVITIES

1. Arrange for student work to be displayed on the bulletin board.

2. Obtain samples from a wallpaper supplier or ask students to bring samples of wallpaper designs. Discuss what the basic unit of design is and what moves have been used to make the pattern.

3. The students might enjoy a challenge such as this. Extend each pattern and guess the products. Check your guess.

(a)  $9 \times 6 = \blacksquare$

$99 \times 66 = \blacksquare$

(b)  $6 \times 7 = \blacksquare$

$66 \times 67 = \blacksquare$

(c)  $37 \times 3 = \blacksquare$

$37 \times 6 = \blacksquare$

OBJECTIVE

To draw enlargements using different sizes of grids

PACING

- Level A All
- Level B All
- Level C All

VOCABULARY

enlarge(ments)

MATERIALS

2 cm squared paper (or larger)

RELATED AIDS

HMS — DM77.

USING THE BOOK

Guide the students through an enlargement of the picture in the pupil display. Point out that, though the second grid and cat's face is larger, its placement on the grid (i.e., the position of the lines of the cat's face relative to the lines and intersection points of the grid) is the same as on the original drawing.

There are several techniques which may be used. The following one seems to be readily adapted by students: start with the tip of an ear; move right one and down one; mark; join these points with a smooth, straight line. Pick the next point — right two; join these points with a looping line; etc.

In Exercises 1 to 4, have students follow the directions. Supervise them closely to see that the students are progressing without error.

ACTIVITIES

- 1. Provide the students with simple maps drawn on grid paper and ask them to enlarge the maps.
- 2. Have the students bring their favourite comic character to class. The student draws 1 cm squares over the character. Then an enlargement is drawn using 2 cm squared paper. (Alternately, you might give each student a piece of transparent plastic on which 1 cm squares are drawn.) Ask students to post their coloured enlargements around the room.

3. Calculate each product.

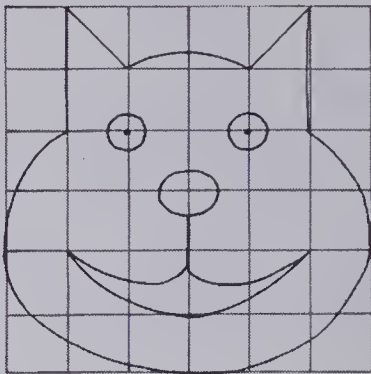
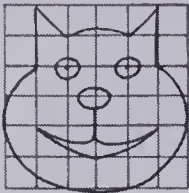
(a) 12 345 679	(b) 12 345 679
× 9	× 18
-----	-----
[111 111 111]	[222 222 222]

Now guess the products. Check your guesses.

(c) 12 345 679	12 345 679	12 345 679
× 27	× 36	× 81
-----	-----	-----
[333 333 333]	[444 444 444]	[999 999 999]

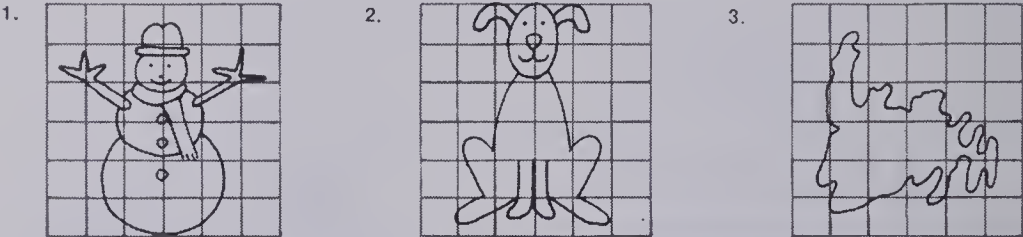
Drawing Enlargements

Tara saw this small pattern in a book. She wanted to draw it larger. She used a grid with larger squares.



Exercises

Use Tara's method to enlarge each picture.



- 4. Use small grid paper. Draw a pattern. Have a classmate make a larger copy.

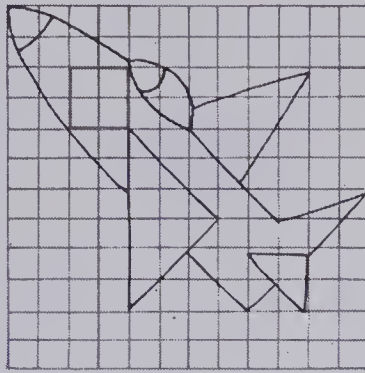
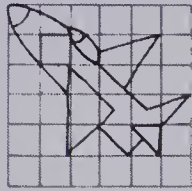
BRAINTICKLER

Use 8 straight lines. Draw 3 squares each of a different size.



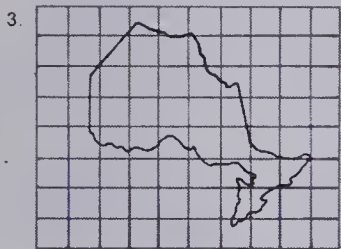
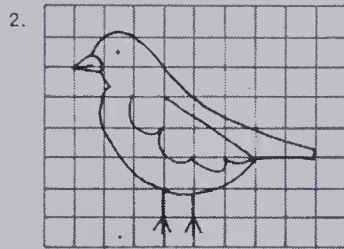
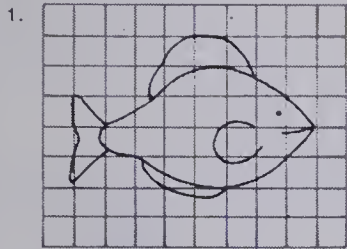
## More Enlargements

Tanya only had grid paper the same size as the patterns.  
Notice how she made her patterns larger.



### Exercises

Use the method Tanya did to make each picture twice as large.



4. Use grid paper.  
Draw a pattern or design.  
Give it to a classmate to draw twice as large.

Enlargements 315

## OBJECTIVE

To draw enlargements using the same size grids

## PACING

Level A Optional  
Level B All  
Level C All

## MATERIALS

0.5 cm grid paper

## RELATED AIDS

HMS — DM78.

## SUGGESTIONS

**Initial Activity** Some students may find this very difficult. Hence, you may wish to treat this as optional material.

## USING THE BOOK

Guide the students through the enlargement of the small airplane in the pupil display. Start with the nose cone; from the tip to the curved line is half a unit. In the new pattern, which is twice as large, the distance is one full unit. Emphasize that distances that are 1 unit become 2 units; that 2 units become 4 units; etc. Use the same technique as used in the previous lesson.

In Exercises 1 to 4, have the students follow the directions. Supervise them closely and provide help where necessary.

## ACTIVITIES

1. Have students colour and display their enlargements.

2. Have students enlarge another of their favourite comic characters. Colour and display the work.

3. Have the students play "Number Sentence" as described in the Activity Reservoir.



OBJECTIVE

To identify corresponding vertices and sides of congruent shapes

PACING

- Level A 1-6
- Level B 1-6, 9
- Level C 1, 3, 5-9

MATERIALS

paper, scissors

BACKGROUND

Corresponding parts are those parts that match when one shape is placed on its congruent partner. We use an arrow to indicate corresponding parts:  $A \rightarrow B$  means that vertex  $A$  matches vertex  $B$ . Similarly, corresponding sides are shown by  $AB \rightarrow CD$ .

SUGGESTIONS

**Initial Activity** Review the matching procedures presented on pages 54 to 57, 306 to 307, and 310 covering slides, turns, flips, and combinations of these transformations.

USING THE BOOK

In Exercises 1 to 8, encourage the students to trace, cut out, and match in order to identify the corresponding vertices and sides. Only when the students are confident that they know the corresponding parts should you encourage them to tell you how to identify the corresponding parts. The balance could then be completed without tracing and cutting.

ACTIVITIES

1. Draw a shape in which a slide and a turn will produce the same result as a flip (i.e., a symmetrical figure).

Example



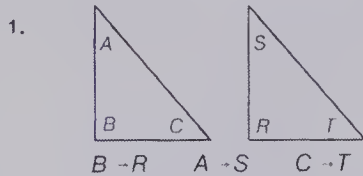
2. See "Treasure Hunt" as described in the Activity Reservoir. Have the pupils search for (and/or label) matching sides and vertices of objects in the school (i.e., classroom doors, windows, lines and shapes on the gym floor, etc.).

3. Ask the pupils to do this activity card.

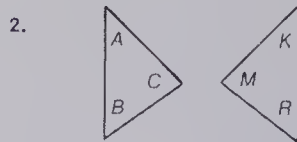
Matching Parts

Identify the matching vertices.

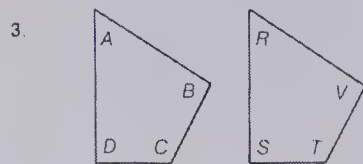
Hint: Trace, cut out, and match.



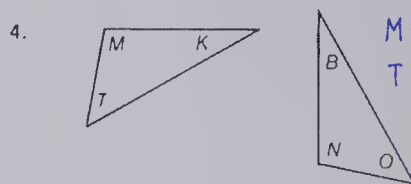
$B \rightarrow R$     $A \rightarrow S$     $C \rightarrow T$



$A \rightarrow K$   
 $C \rightarrow M$   
 $B \rightarrow R$

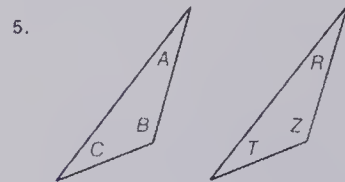


$A \rightarrow R$   
 $B \rightarrow V$   
 $C \rightarrow T$   
 $D \rightarrow S$

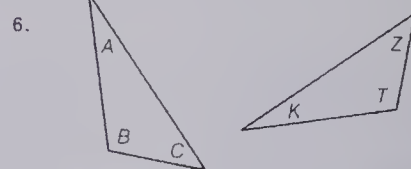


$K \rightarrow B$   
 $M \rightarrow N$   
 $T \rightarrow O$

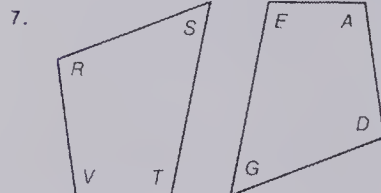
Identify the matching sides. If necessary, use the hint above.



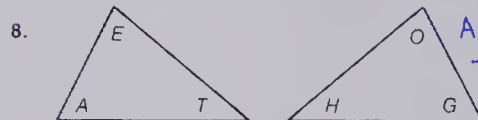
$AC \rightarrow RT$     $BC \rightarrow ZT$     $AB \rightarrow RZ$   
 $R \rightarrow D$



$A \rightarrow K$   
 $B \rightarrow T$   
 $C \rightarrow Z$

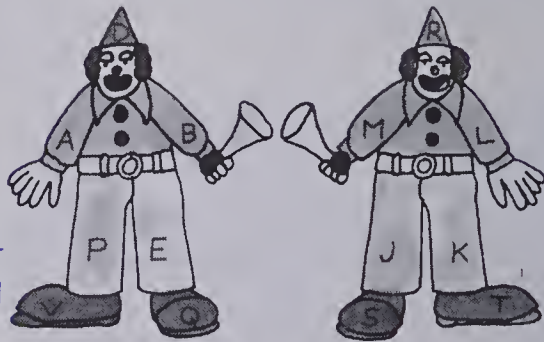


$S \rightarrow G$   
 $T \rightarrow E$   
 $V \rightarrow A$



$E \rightarrow O$   
 $A \rightarrow G$   
 $T \rightarrow H$

9. Identify matching parts of the Twin Clowns.

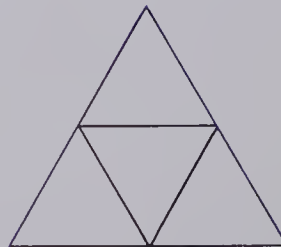


316 Corresponding vertices and sides

ANSWERS:

9.  $D \rightarrow R$ ;  $A \rightarrow L$ ;  $B \rightarrow M$ ;  $P \rightarrow K$ ;  $E \rightarrow J$ ;  $V \rightarrow T$ ;  $Q \rightarrow S$

The answer:



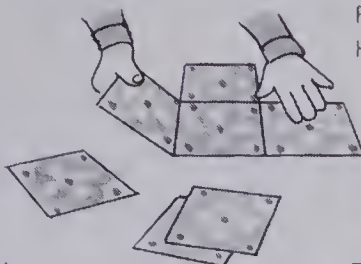
Take 5 straws of the same length. Cut 2 of the straws in half. Set aside one of the short straws. You now have 3 long and 3 short straws. Arrange the 3 long and 3 short straws to form 5 equilateral triangles: 4 are congruent and 1 is larger. An equilateral triangle has 3 congruent sides.

## Tiles

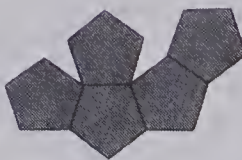
Lonnie had tiles of this shape.  
He put them together.



Lonnie's tiles covered the whole space.



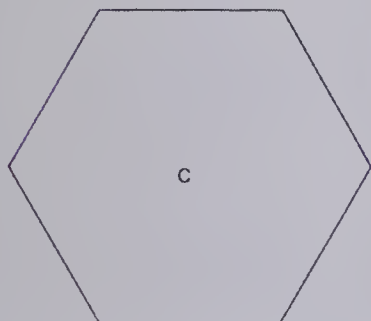
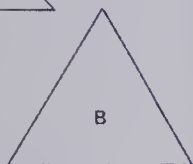
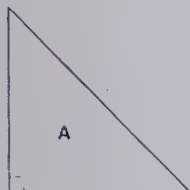
Reg had tiles of this shape.  
He put them together.



Reg's tiles left holes in the pattern.

### Exercises

Work with classmates.



12 × 12 cm square

1. Use triangles like **A**.  
Fit them on this square.  
Can you cover this square without leaving any holes? **Yes**  
Do not overlap the triangles.

2. Repeat Exercise 1 using  
Figure **B**, Figure **C**, Figure **D**,  
and Figure **E**.

*Figures B, C, D, and E leave holes  
when covering the square exactly.*



## OBJECTIVE

To identify which shapes, when put together, will cover a space and which shapes leave holes

## PACING

Level A All  
Level B All  
Level C All

## MATERIALS

paper, scissors, square and pentagonal cutout tiles

## RELATED AIDS

HMS — DM79.

## BACKGROUND

Shapes which cover a space without overlapping or leaving holes are said "to tile" or "to tessellate". Some shapes will tessellate but cannot cover certain spaces without leaving holes along the edge.

Two References

Escher, M.C.; *The Graphic Work of M.C. Escher*, Ballentine Books, New York.

Ranucci, E.R., Teeters, J.L.; *Creating Escher Type Drawings*, Creative Publications, Palo Alto.

## USING THE BOOK

Use the pre-cut shapes to illustrate the pupil display. For Exercise 1, direct the students to use each shape in turn. Discuss which can cover space and which can cover the large square without leaving holes.

You may wish to either (a) prepare shapes A, B, C, D, and E (several of each) on paper for distribution to the class, or (b) have the students work in small groups to trace and cut out the five shapes required to cover the 12 cm × 12 cm square.

## ACTIVITIES

1. Challenge students to make other shapes which cover space without leaving holes.

2. Have the students use the library to learn about Escher-type tessellations. Students may write

illustrated reports on Escher and his work.

3. Obtain *Creating Escher Type Drawings* by E.R. Ranucci, and J.L. Teeters, from the library. Ask students to use it to draw Escher-type tessellations. They might be asked to colour and display their work.

## OBJECTIVE

To solve word problems involving the four operations

## PACING

Level A 1-4

Level B All

Level C All

## VOCABULARY

physical therapist, disabled, patient, treatment

## USING THE BOOK

Discuss the work of a physical therapist. See the Chapter Overview on page 296 of the teaching notes.

If some students are weak in reading, you may use this page as a reading lesson. If you do this, reduce the number of questions you assign these students.

## ACTIVITIES

1. Invite a physical therapist to speak to your class. The students should write a brief report or draw a picture after the visit to illustrate something they learned.

2. Students might enjoy writing some word problems of their own. You may wish to provide guidance.

### Examples

Use these words and numbers to write a word problem.

(a) walked 5 km/d, treatment, ■ days

(b) weightlifter, 65 kg, 6 lifts

(c) In January, Ms Hall treated 212 patients. In February, she treated 300.

3. See "Number Sentence" as described in the Activity Reservoir.

## EXTRA PRACTICE

1. Marco lifts weights to strengthen his injured arm. He started by lifting 2 kg. Every week, he increased the mass by 1 kg. How much was he lifting in his 8th week? [9 kg]

2. Mrs. Morris spent  $3\frac{1}{4}$  h with one patient,  $2\frac{1}{4}$  h with another, and  $1\frac{1}{2}$  h with a third. How long altogether did she spend with the 3 patients? [7 h]

3. Leslie paid \$150 for X-rays. She also paid for each hour of treatment. She received 2 h of treatment. What was the total cost? [\$206]

4. Mr. Rogers charges patients \$40 for the first visit and \$28 for each additional visit. How much did he charge Jackie who made 8 visits? [\$236]



## Physical Therapist



Physical therapists help people who have been disabled by illnesses or accidents.

1. Ms. Forban kept records of patients treated.  
In January she treated 153, in February she treated 224, in March she treated 188, and in April she treated 243.  
What was the average number of patients she treated per month? **202**
2. John received treatments for an injured back.  
He spent 30 min/d for 5 d under treatment.  
How many hours was he under treatment? **2.5 h**
3. After a severe accident, Jill had to learn to walk again.  
Holding a special rail, she walked 15 m each day for 3 weeks.  
How far did she walk? **315 m**
4. Mrs. Sherbach, a physical therapist, went to school for additional training.  
She attended classes 4.5 h/d for a 5 d week for 10 weeks.  
How many hours of classes did she attend? **225 h**
- ★ 5. Mr. Henry helped a patient to walk.  
The first week the patient walked 10 m each day.  
Each week the patient increased the distance by 10 m.  
How far was the patient walking after 12 weeks? **120 m each day**



## Practice

Calculate

1.  $3.4 + 4.65 + 62.3 + 0.07$  **70.42**
2.  $329\,454.6 + 764\,564.44 + 674.6$  **1\,094\,693.64**
3.  $234\,567.6 - 41\,162.67$  **193\,404.93**
4.  $500.6 - 18.48$  **482.12**
5.  $72 \times 32.4$  **2332.8**
6.  $73.4 \times 56.2$  **4125.08**
7.  $60.4 \times 0.03$  **1.812**
8.  $3144 \times 0.34$  **1068.96**
9.  $1642 \times 0.78$  **1280.76**
10.  $476.4 \times 0.8$  **381.12**
11.  $4 \overline{) 6.4}$  **1.6**
12.  $8 \overline{) 21.6}$  **2.7**
13.  $7 \overline{) 94.9}$  **13.5**
14.  $9 \overline{) 9.63}$  **1.07**
15.  $22 \overline{) 46.2}$  **2.1**
16.  $23 \overline{) 52.9}$  **2.3**
17.  $56 \overline{) 1.69}$  **0.03**
18.  $41 \overline{) 373.1}$  **9.1**

Use short division. Express remainders as fractions.

19.  $9 \overline{) 108}$  **12**
20.  $6 \overline{) 233}$   **$38 \frac{5}{6}$**
21.  $7 \overline{) 709}$   **$101 \frac{2}{7}$**
22.  $8 \overline{) 61.6}$  **7.7**

Calculate.

23.  $8 \times 6 + 4$  **52**
24.  $45 - 6 \times 6$  **9**
25.  $8 \times 6 \div 4 + 5$  **17**
26.  $6 - 2 \times 3 + 4 \div 2$  **2**
27.  $40 + 5 \times 5 + 12 \div 6$  **67**
28.  $5 \times (3 + 2) + (8 - 2)$  **21**
29.  $27 - (2 \times 5) - (4 + 2)$  **11**

Copy and complete.

30.  $7\text{ m} = \frac{700}{230} \text{ cm}$
31.  $3\text{ km} = \frac{3000}{1500} \text{ m}$
32.  $2\text{ t} = \frac{2000}{1500} \text{ kg}$
33.  $5000\text{ g} = \frac{5}{34} \text{ kg}$
34.  $300\text{ dm} = \frac{30}{15} \text{ m}$
35.  $5\text{ kL} = \frac{5000}{2300} \text{ L}$
36.  $2.3\text{ m} = \frac{230}{1000} \text{ km}$
37.  $1.5\text{ km} = \frac{1500}{1000} \text{ m}$
38.  $1.5\text{ t} = \frac{1500}{1000} \text{ kg}$
39.  $2.3\text{ kL} = \frac{2300}{1000} \text{ L}$

Calculate where possible.

36.  $6 \times 16$  **96**
37.  $7 \div 7$  **1**
38.  $16 \times 0$  **0**
39.  $23 + 0$  **23**
40.  $4 \div 0$  **Not possible**
41.  $51 \times 0$  **0**
42.  $1 \times 91$  **91**
43.  $33 - 0$  **33**
44.  $5 \times (6 + 3)$  **45**
45.  $44 \times (9 - 1)$  **352**
46.  $0 \div 8$  **0**
47.  $0 \times 99$  **0**

Practice operations 319

## OBJECTIVE

To review and maintain computational skills

## PACING

Level A Odd-numbered exercises  
Level B Even-numbered exercises  
Level C Optional

## USING THE BOOK

Assign the exercises as indicated in the Pacing section. If students have difficulties, you may wish to (a) provide remediation, (b) assign the balance of that type of exercise or related exercises. The following chart indicates where the specific topics were presented in the text.

Exercise	Page
1-4	11-21
5-10	93-95
11-18	274-275
19-22	272-273
23-29	280-283
30-35	107-122
36-47	198-203

## ACTIVITIES

1. Have the students make a coded joke to challenge their classmates as shown on page 133 of the student's text. Remind the students that they are to check their puzzle carefully. Calculators would be helpful in that regard.

2. Have the students make a cross-number puzzle. Again, remind them to check their puzzles for accuracy. You may wish to provide graph paper.

## OBJECTIVE

To evaluate achievement of the chapter objectives

## PACING

Level A All  
Level B All  
Level C All

## RELATED AIDS

HMS — DM80.

## USING THE BOOK

Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a large number of students had difficulty with a particular topic or concept.

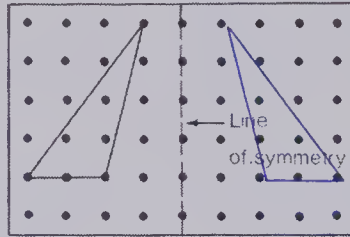
The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 296).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

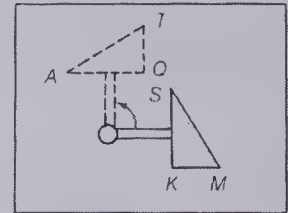
Test Item	Objective	Text Page Number
1	C	298
2	F	316
3	A	306
4	B	308
5	E	299
6	D	314

## Chapter Test

1. Use dot paper. Copy.  
Make a flip pattern.

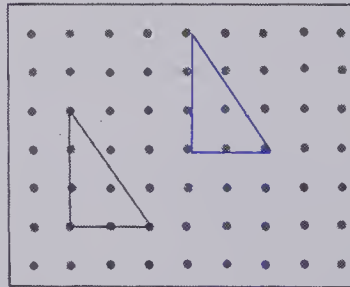


2. This is a turn pattern.  
Name the matching vertices.

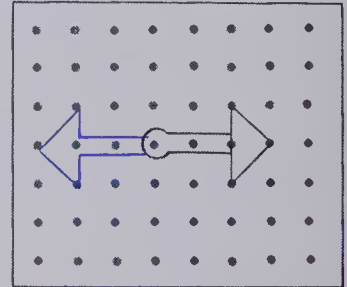


$S \rightarrow A$   
 $M \rightarrow T$   
 $K \rightarrow Q$

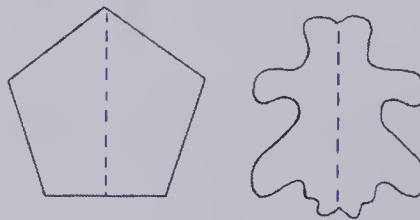
3. Copy and draw the slide right 3, up 2.



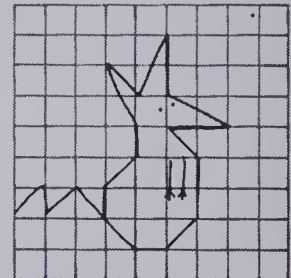
4. Copy and draw a  $\frac{1}{2}$  turn.



5. Copy and draw the lines of symmetry on each.



6. Make this pattern larger using squared paper.



## Cumulative Review

Calculate.

$$\begin{array}{r} 1. \quad 327 \\ \times 27 \\ \hline 8748 \end{array}$$

$$\begin{array}{r} 2. \quad 32.45 \\ \times 0.3 \\ \hline 9.735 \end{array}$$

$$3. \quad 24 \overline{)1926} \quad \begin{array}{l} 80R6 \end{array}$$

$$4. \quad 32 \overline{)1472} \quad \begin{array}{l} 46 \end{array}$$

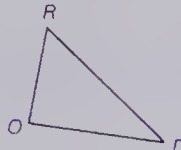
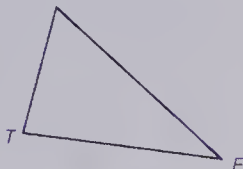
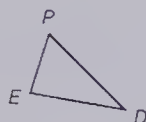
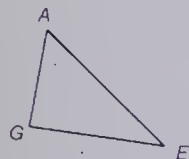
$$5. \quad 5.8 - 0.1 \quad 58$$

$$6. \quad 34.5 \div 10 \quad 34$$

$$7. \quad \frac{1}{4} + \frac{1}{3} \quad \frac{7}{12}$$

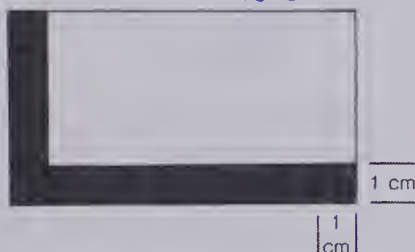
$$8. \quad \frac{4}{5} - \frac{1}{3} \quad \frac{7}{15}$$

9. Which shape is congruent to  $\triangle AGE$ ?  $\triangle ROD$



10. Temperature is measured using an instrument called a **thermometer** and uses units called **degrees Celsius**.

11. Calculate the area.  $45 \text{ cm}^2$



12. Draw a broken line graph for the data.

Time of Day	Temperature
06:00	8°C
09:00	16°C
12:00	20°C
15:00	22°C
18:00	14°C
21:00	10°C

13. Which numbers are prime?

**2** **13** 16 21 **3**

14. Find the average of:

3.2 4.6 9.6 7.4 **6.2**

15. Find 25% of 60. **15**

Chapters 1-10. cumulative review 321

## OBJECTIVE

To review and test selected concepts and skills previously covered

## PACING

Level A All  
Level B All  
Level C All

## USING THE BOOK

This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a large number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic or, refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

## Test Item | Text Page Number

1	86
2	94
3	145
4	139
5, 6	107
7	246
8	247
9	52
10	124
11	155
12	180, 181
13	213
14	284
15	259



# Skills Check Up—Chapters 1 to 5

Give the correct answer for each (a), (b), (c), or (d)

1. 
$$\begin{array}{r} 134\,273 \\ 403\,614 \\ + 924\,078 \\ \hline \end{array}$$
 (a) 1 461 855  
(b) 1 471 965  
(c) 1 461 965  
(d) 1 591 965

2. 
$$\begin{array}{r} 785.27 \\ - 342.43 \\ \hline \end{array}$$
 (a) 442.84  
(b) 1127.70  
(c) 443.24  
(d) 1027.70

3. Which number completes each display?

Rule Subtract 58	
Enter	Display
128	70
101	43
200	

- (a) 124 (b) 142  
(c) 132 (d) 158  
(b)

Rule Add 2 09	
Enter	Display
0 10	2 19
5 82	7 91
6 25	

- (a) 8 34 (b) 4 16  
(c) 7 24 (d) 9 33  
(a)

Name the shape of each coloured face.

(a) rectangle

(b) square

(c) circle

(d) triangle



7. Choose the correct numerals for

8 tens, 6 ones, 3 tenths, 5 hundredths, 9 thousandths (d)

- (a) 9536.8 (b) 8.6359 (c) 0.86359 (d) 86.359

8. 6582 rounded to the nearest thousand is (b)

- (a) 6000 (b) 7000 (c) 6600 (d) 6580

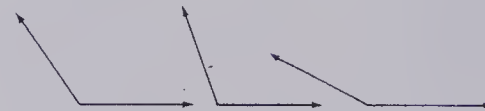
9. 3.447 rounded to the nearest hundredth is (c)

- (a) 3.547 (b) 3.457 (c) 3.45 (d) 3.44

10. These angles are (d)

(a) congruent angles (b) right angles

(c) acute angles (d) obtuse angles



322 Basic skills check up chapters 1 to 5

11. Which shape is a parallelogram? (a)



12.  $40 \times 700$  (a) 280 (b) 280 000  
(c) 2800 (d) 28 000  
(d)

13.  $84 \times 1000$  (a) 84 000 (b) 80 400  
(c) 8400 (d) 840 000  
(a)

14. 
$$\begin{array}{r} 840 \\ \times 48 \\ \hline \end{array}$$
 (a) 40 328 (b) 40 368  
(c) 40 320 (d) 40 020  
(c)

15. 
$$\begin{array}{r} 19.43 \\ \times 0.27 \\ \hline \end{array}$$
 (a) 2.2451 (b) 5.2461  
(c) 52.461 (d) 0.524 61  
(b)

16. Mr Meadows bought 3 smoke detectors. Each detector cost \$21.95. How much for three? (c)  
(a) \$63.75 (b) \$64.25  
(c) \$65.85 (d) \$63.85

17. 1284 eggs were sold at the market 12 in each carton. How many cartons? (a)  
(a) 107 (b) 15 408 (c) 17 (d) 81

18.  $583 \div 10$  (a) 5830 (b) 58.3  
(c) 5.83 (d) 0.583  
(b)

19.  $34 \overline{) 517}$  (a) 15 R7 (b) 15  
(c) 18 R5 (d) 18 R7  
(a)

20.  $61 \overline{) 4768}$  (a) 77 R19 (b) 78  
(c) 78 R10 (d) 78 R30  
(c)

21.  $56 \overline{) 8571}$  (a) 153 R3 (b) 153  
(c) 153 R9 (d) 154  
(a)

22. 2 km = ■ m (c)

- (a) 20 (b) 200  
(c) 2000 (d) 20 000

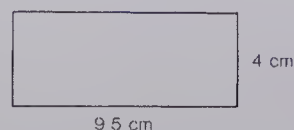
23. 4000 mL = ■ L (a)

- (a) 4 (b) 40  
(c) 400 (d) 0.4

24. 3 kg = ■ g (d)

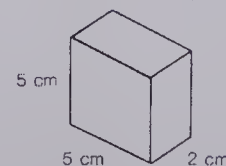
- (a) 0.3 (b) 30  
(c) 300 (d) 3000

25. Find the area. (b)



- (a) 380 cm<sup>2</sup> (b) 38.0 cm<sup>2</sup>  
(c) 3.8 cm<sup>2</sup> (d) 0.38 cm<sup>2</sup>

26. Find the volume. (d)



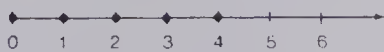
- (a) 25 cm<sup>3</sup> (b) 10 cm<sup>3</sup>  
(c) 27 cm<sup>3</sup> (d) 50 cm<sup>3</sup>

Basic skills check up chapters 1 to 5 323

## Skills Check Up—Chapters 6 to 10

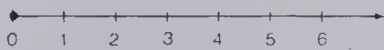
Give the correct answer for each (a), (b), (c), or (d).

1. Which inequality does this graph show? (b)



- (a)  $3 + \blacksquare < 5$  (b)  $9 + N < 14$   
(c)  $12 - N > 9$  (d)  $2 \times \blacksquare > 10$

2. Which equation does this graph show? (d)



- (a)  $6 \times 1 = N$  (b)  $13 + \blacksquare = 14$   
(c)  $9 - N = 0$  (d)  $10 \times 0 = \blacksquare$

Which number is the correct output in each chart?

3. Rule: Multiply by 7

Input	Output
3	21
5	35
7	$\blacksquare$

- (a) 42 (b) 49  
(c) 14 (d) 56

(b)

4. Rule: Divide by 2 and add 3

Input	Output
50	28
20	13
18	$\blacksquare$

- (a) 9 (b) 6  
(c) 18 (d) 12

(d)

5. Which number is divisible by 4? (c)  
(a) 90 (b) 114 (c) 208 (d) 403

6. Which number is divisible by 9? (b)  
(a) 25 471 (b) 279 936  
(c) 28 055 (d) 1 135 172

7. The set of factors for 32 is (d)  
(a) 3, 8 (b) 2, 8, 16  
(c) 1, 4, 16, 32 (d) 1, 2, 4, 8, 16, 32

8. Which number is a prime number? (b)  
(a) 4 (b) 5 (c) 6 (d) 8

10. The prime factors of 60 are. (c)  
(a) 1, 60 (b) 1, 2, 4, 15  
(c) 2, 3, 2, 5 (d) 2, 3, 10

9. Which number is a composite number? (b)  
(a) 3 (b) 9 (c) 13 (d) 11

11. 60 written as a product of its prime factors is (c)  
(a)  $1 \times 60$  (b)  $1 \times 2 \times 4 \times 15$  (c)  $2 \times 3 \times 2 \times 5$  (d)  $2 \times 3 \times 10$

12. The least common multiple of 6 and 8 is (c)  
(a) 12 (b) 16 (c) 24 (d) 48

14. 10 000 written in exponent form is. (d)

13. The greatest common factor of 24 and 32 is. (b)  
(a) 2 (b) 8 (c) 4 (d) 16

- (a)  $10^1$  (b)  $10^2$   
(c)  $10^3$  (d)  $10^4$

324 Basic skills check up chapters 6 to 10

15.  $\frac{1}{3}$  of 18 is (c) (a) 6 (b) 9  
(c) 12 (d) 15

16. Which fraction is greater than  $\frac{3}{4}$ ? (d)  
(a)  $\frac{2}{3}$  (b)  $\frac{1}{2}$  (c)  $\frac{2}{8}$  (d)  $\frac{4}{5}$

17.  $\frac{2}{5} + \frac{1}{4} = \frac{\blacksquare}{20}$  (c) (a)  $\frac{9}{20}$  (b)  $\frac{13}{20}$   
(c)  $\frac{13}{20}$  (d)  $\frac{9}{20}$

18.  $\frac{2}{3} - \frac{1}{4} = \frac{\blacksquare}{12}$  (a) (a)  $\frac{5}{12}$  (b)  $\frac{4}{12}$   
(c)  $\frac{23}{12}$  (d)  $\frac{6}{12}$

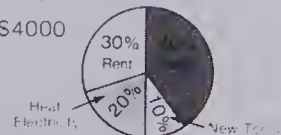
19.  $3\frac{2}{5} + 5\frac{1}{10} = \frac{\blacksquare}{10}$  (b) (a)  $8\frac{2}{10}$  (b)  $8\frac{4}{10}$   
(c)  $8\frac{5}{10}$  (d)  $8\frac{6}{10}$

20.  $\frac{1}{2} \div \frac{1}{4} = \frac{\blacksquare}{1}$  (c) (a) 1 (b) 8  
(c) 4 (d) 7

21.  $\frac{1}{2} = \frac{\blacksquare}{4}$  (d) (a)  $\frac{1}{4}$  (b)  $\frac{2}{4}$   
(c)  $\frac{11}{4}$  (d)  $\frac{2}{4}$

22.  $\frac{7}{10} = \frac{\blacksquare}{100}$  (c) (a) 7 (b) 70  
(c) 35 (d) 14

23. The yearly expenses for "Al's Fix it Shop" are shown in this circle graph. The total is \$4000. How much does Al spend on rent each year? (b)



- (a) \$1600 (b) \$1200 (c) \$120 (d) \$12 000

24.  $3 \overline{)15.72}$  (c) (a) 0.524 (b) 52.4 (c) 5.24 (d) 524

25.  $(2 \times 4) \times 6 + 1 = 2 \times (\blacksquare \times 6) + 1$  (b) (a) 2 (b) 4 (c) 6 (d) 1

26.  $7 + (8 + 9) = (7 + \blacksquare) + 9$  (c) (a) 1 (b) 7 (c) 8 (d) 9

27.  $5 \times 2 + 5 \times 4 = 5 \times (2 + \blacksquare)$  (b) (a) 5 (b) 4 (c) 2 (d) 1

28.  $20 - \blacksquare = 1$  (d) (a) 0 (b) 1  
(c) 10 (d) 20

29.  $12 - \blacksquare = 12$  (b) (a) 0 (b) 1  
(c) 6 (d) 12

30.  $5 \times 12 = \blacksquare \times 5$  (d) (a) 0 (b) 1  
(c) 5 (d) 12

31.  $19 + \blacksquare = 19$  (a) (a) 0 (b) 1  
(c) 19 (d) 9

32.  $19 \times \blacksquare = 19$  (b) (a) 0 (b) 1  
(c) 19 (d) 9

33.  $(40 - 10) - 5 + 10 = \blacksquare$  (b) (a) 2 (b) 16 (c) 20 (d) 28

34.  $25 - 4 + 6 \times 3 = \blacksquare$  (b) (a) 18 (b) 39 (c) 3 (d) 45

35. What is the average of these gymnastics scores? (c)  
9.6, 8.5, 7.9, 8.4, 9.0, 8.8  
(a) 5.2 (b) 7.8  
(c) 8.7 (d) 9.1

Basic skills check up chapters 6 to 10 325

## Extra Practice — Chapter One

Add

- $$\begin{array}{r} 420 \\ 156 \\ + 387 \\ \hline 963 \end{array}$$
  - $$\begin{array}{r} 538 \\ 207 \\ + 164 \\ \hline 909 \end{array}$$
  - $$\begin{array}{r} 700 \\ 439 \\ + 295 \\ \hline 1434 \end{array}$$
  - $$\begin{array}{r} 275 \\ 30 \\ + 382 \\ + 66 \\ \hline 753 \end{array}$$
  - $$\begin{array}{r} 49 \\ 152 \\ 76 \\ + 290 \\ \hline 567 \end{array}$$
- $$\begin{array}{r} 47 \\ + 8.5 \\ \hline 13.2 \end{array}$$
  - $$\begin{array}{r} 6.2 \\ + 7.9 \\ \hline 14.1 \end{array}$$
  - $$\begin{array}{r} \$46.25 \\ + 18.06 \\ \hline \$64.31 \end{array}$$
  - $$\begin{array}{r} 50.15 \\ + 46.99 \\ \hline 97.14 \end{array}$$
  - $$\begin{array}{r} 73.48 \\ + 79.15 \\ \hline 152.63 \end{array}$$
- $$\begin{array}{r} \$253.18 \\ + 197.56 \\ \hline \$450.74 \end{array}$$
  - $$\begin{array}{r} 108.62 \\ + 357.19 \\ \hline 465.81 \end{array}$$
  - $$\begin{array}{r} \$3405.79 \\ + 5168.34 \\ \hline \$8574.13 \end{array}$$
  - $$\begin{array}{r} 4077.28 \\ + 3917.25 \\ \hline 8044.53 \end{array}$$
- $$\begin{array}{r} 488735 \\ + 206180 \\ \hline 694915 \end{array}$$
  - $$\begin{array}{r} 529618 \\ + 276094 \\ \hline 805712 \end{array}$$
  - $$\begin{array}{r} \$8574.13 \\ + 38719 \\ \hline \$86599.13 \end{array}$$
  - $$\begin{array}{r} 60452 \\ + 103959 \\ \hline 164411 \end{array}$$
- Write numerals for each.
  - 2 thousands, 5 hundreds, 0 tens, 7 ones  
2507
  - zero decimal four six  
0.46
  - 100 000 + 50 000 + 3000 + 200 + 90 + 3  
153 293
  - 4 tens, 7 ones, 2 tenths, 5 hundredths, 3 thousandths  
47.253
  - seven and thirty-eight hundredths  
7.38

Subtract

- $$\begin{array}{r} 73 \\ - 4.6 \\ \hline 68.4 \end{array}$$
  - $$\begin{array}{r} 8.0 \\ - 3.2 \\ \hline 4.8 \end{array}$$
  - $$\begin{array}{r} \$72.15 \\ - 26.83 \\ \hline \$45.32 \end{array}$$
  - $$\begin{array}{r} 51.63 \\ - 38.17 \\ \hline 13.46 \end{array}$$
  - $$\begin{array}{r} 30.01 \\ - 16.52 \\ \hline 13.49 \end{array}$$
- $$\begin{array}{r} \$356.14 \\ - 187.03 \\ \hline \$169.11 \end{array}$$
  - $$\begin{array}{r} 614.25 \\ - 527.64 \\ \hline 86.61 \end{array}$$
  - $$\begin{array}{r} \$5823.40 \\ - 1856.75 \\ \hline \$3966.65 \end{array}$$
  - $$\begin{array}{r} 7052.19 \\ - 2586.14 \\ \hline 4466.05 \end{array}$$
- $$\begin{array}{r} 607 \\ - 268 \\ \hline 339 \end{array}$$
  - $$\begin{array}{r} 415 \\ - 176 \\ \hline 239 \end{array}$$
  - $$\begin{array}{r} 700 \\ - 243 \\ \hline 457 \end{array}$$
  - $$\begin{array}{r} 5172 \\ - 3264 \\ \hline 1908 \end{array}$$
  - $$\begin{array}{r} 6031 \\ - 2572 \\ \hline 3459 \end{array}$$
- $$\begin{array}{r} 622571 \\ - 450190 \\ \hline 172381 \end{array}$$
  - $$\begin{array}{r} 304281 \\ - 158466 \\ \hline 145815 \end{array}$$
  - $$\begin{array}{r} 761910 \\ - 173254 \\ \hline 588656 \end{array}$$
  - $$\begin{array}{r} 543092 \\ - 467183 \\ \hline 75909 \end{array}$$

326 Extra practice — chapter one

## Extra Practice — Chapter One

1. Copy and complete the table

Rule ?	
Enter	Display
8	21
13	26
23	36
36	<input type="text"/> 49
8	<input type="text"/> 21
10	<input type="text"/> 23

My rule is  Add 13

2. Round 6375.914 to the nearest.

- hundredth 6375.91
- tenth 6375.9
- one 6376
- ten 6380
- hundred 6400
- thousand 6000

3. Write numerals for each

- three hundred fifty-five thousand, sixty 355 060
- 70 000 + 3000 + 52 + 0.03 73 052.03
- thirty-one million 31 000 000
- 5 tens, 2 tenths, 3 hundredths, 4 thousandths 5.234

4. Add.

- $$\begin{array}{r} 6167.34 \\ + 1987.69 \\ \hline 8155.03 \end{array}$$
- $$\begin{array}{r} 502.34 \\ + 103.89 \\ \hline 606.23 \end{array}$$
- $$\begin{array}{r} 258.1 \\ 75.3 \\ + 573.6 \\ \hline 907.0 \end{array}$$
- $$\begin{array}{r} 384 \\ 86 \\ 456 \\ 78 \\ + 3465 \\ \hline 4469 \end{array}$$

5. Subtract.

- $$\begin{array}{r} 630.14 \\ - 239.86 \\ \hline 390.28 \end{array}$$
- $$\begin{array}{r} 700.00 \\ - 116.68 \\ \hline 583.32 \end{array}$$
- $$\begin{array}{r} 6430.56 \\ - 1431.63 \\ \hline 4998.93 \end{array}$$

6. Compare. Use >, <, or =.

- 523.46 > 523.37
- 62.00 < 63.13
- 54 567 < 54 666
- 7 145 < 7 145

7. There were 2351 Canada geese counted at the refuge

There were 3752 white geese counted

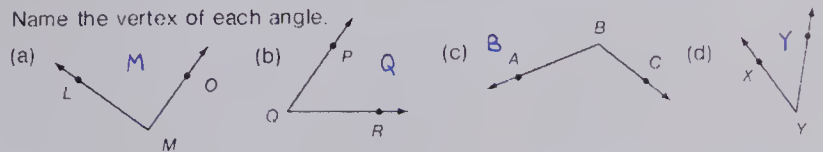
Round to the nearest thousand to estimate the number of geese counted in all. 2000 + 4000 = 6000

Extra practice — chapter one 327



## Extra Practice—Chapter Two

1. Name the vertex of each angle.



2. In Exercise 1 above, name each type of angle (a) right angle (b) acute angle  
3. Use a protractor to find the measure of each angle in Exercise 1 (c) obtuse angle  
(a)  $90^\circ$  (b)  $55^\circ$  (c)  $120^\circ$  (d)  $45^\circ$  (d) acute angle  
4. (a) Use compasses to draw a circle with a diameter of 6 cm  
(b) What is the length of a radius of your circle? 3 cm

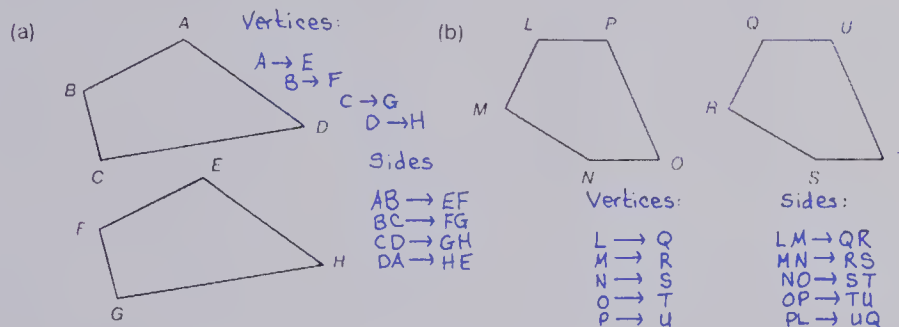
5. Use a ruler to draw a parallelogram. Label it ABCD.



6. Are these pairs of shapes congruent? Write a statement.



7. The polygons in each pair are congruent. They match by a slide. Name the matching vertices and sides.

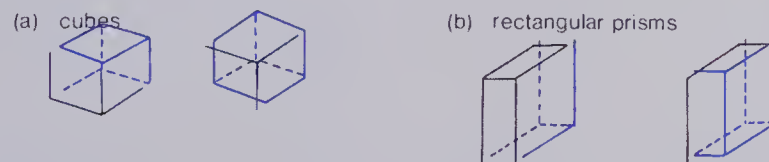


328 Extra practice — chapter two

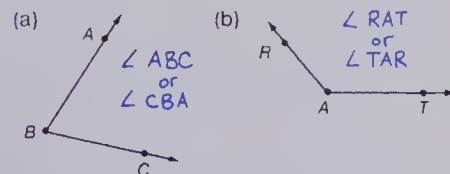
## Extra Practice—Chapter Two

1. Use straws and pipe cleaners to make a model of  
(a) a cube (b) a rectangular prism

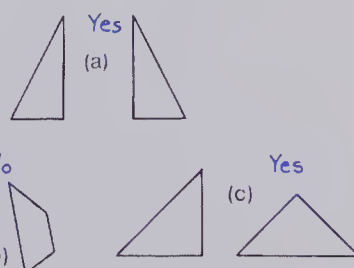
2. Trace and complete each.



3. Name each angle two ways. 41  
(a)  $\angle ABC$  or  $\angle CBA$  (b)  $\angle RAT$  or  $\angle TAR$



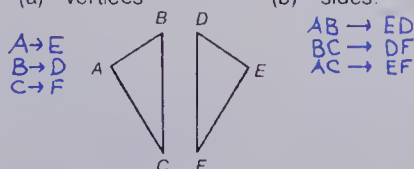
4. Are the polygons in each pair congruent? Yes or no. 52



5. Use a protractor to find the measure of each angle in Exercise 3.  
(a)  $10^\circ$  (b)  $130^\circ$  50

6. Name the two types of angles in Exercise 3. 48  
(a) acute angle (b) obtuse angle

7. Name the corresponding 54  
(a) vertices (b) sides.



8. 1725 polar bears. 65  
6185 caribou.  
Round to the nearest thousand to estimate the difference between the number of caribou and the number of bears.  $6000 - 2000 = 4000$

## Extra Practice—Chapter Three

Multiply

1. (a)  $7 \times 100$  700 (b)  $3 \times 10$  30 (c)  $5 \times 1000$  5000 (d)  $6 \times 40$  240 (e)  $7 \times 500$  3500
2. (a)  $\begin{array}{r} 26 \\ \times 4 \\ \hline 104 \end{array}$  (b)  $\begin{array}{r} 37 \\ \times 5 \\ \hline 185 \end{array}$  (c)  $\begin{array}{r} 51 \\ \times 9 \\ \hline 459 \end{array}$  (d)  $\begin{array}{r} 362 \\ \times 4 \\ \hline 1448 \end{array}$  (e)  $\begin{array}{r} 157 \\ \times 6 \\ \hline 942 \end{array}$
3. (a)  $\begin{array}{r} 2058 \\ \times 3 \\ \hline 6174 \end{array}$  (b)  $\begin{array}{r} 6173 \\ \times 5 \\ \hline 30865 \end{array}$  (c)  $\begin{array}{r} 4902 \\ \times 6 \\ \hline 29412 \end{array}$  (d)  $\begin{array}{r} 51407 \\ \times 4 \\ \hline 205628 \end{array}$  (e)  $\begin{array}{r} 30816 \\ \times 7 \\ \hline 215712 \end{array}$
4. (a)  $\begin{array}{r} 0.8 \\ \times 2 \\ \hline 1.6 \end{array}$  (b)  $\begin{array}{r} 4.6 \\ \times 3 \\ \hline 13.8 \end{array}$  (c)  $\begin{array}{r} 2.9 \\ \times 7 \\ \hline 20.3 \end{array}$  (d)  $\begin{array}{r} 18.7 \\ \times 5 \\ \hline 93.5 \end{array}$  (e)  $\begin{array}{r} 31.6 \\ \times 4 \\ \hline 126.4 \end{array}$
5. (a)  $\begin{array}{r} 2.65 \\ \times 5 \\ \hline 13.25 \end{array}$  (b)  $\begin{array}{r} 71.32 \\ \times 4 \\ \hline 285.28 \end{array}$  (c)  $\begin{array}{r} 410.61 \\ \times 6 \\ \hline 2463.66 \end{array}$  (d)  $\begin{array}{r} 7.321 \\ \times 4 \\ \hline 29.284 \end{array}$  (e)  $\begin{array}{r} 1.807 \\ \times 9 \\ \hline 16.263 \end{array}$
6. (a)  $\begin{array}{r} 46 \\ \times 13 \\ \hline 598 \end{array}$  (b)  $\begin{array}{r} 38 \\ \times 25 \\ \hline 950 \end{array}$  (c)  $\begin{array}{r} 80 \\ \times 74 \\ \hline 5920 \end{array}$  (d)  $\begin{array}{r} 156 \\ \times 31 \\ \hline 4836 \end{array}$  (e)  $\begin{array}{r} 480 \\ \times 27 \\ \hline 12960 \end{array}$
7. (a)  $\begin{array}{r} 118 \\ \times 225 \\ \hline 26550 \end{array}$  (b)  $\begin{array}{r} 407 \\ \times 132 \\ \hline 53724 \end{array}$  (c)  $\begin{array}{r} 150 \\ \times 346 \\ \hline 51900 \end{array}$  (d)  $\begin{array}{r} 286 \\ \times 107 \\ \hline 30602 \end{array}$  (e)  $\begin{array}{r} 543 \\ \times 245 \\ \hline 133035 \end{array}$
8. (a)  $\begin{array}{r} 46 \\ \times 0.3 \\ \hline 13.8 \end{array}$  (b)  $\begin{array}{r} 59 \\ \times 0.5 \\ \hline 29.5 \end{array}$  (c)  $\begin{array}{r} 271 \\ \times 0.6 \\ \hline 162.6 \end{array}$  (d)  $\begin{array}{r} 380 \\ \times 0.4 \\ \hline 152.0 \end{array}$  (e)  $\begin{array}{r} 6252 \\ \times 0.7 \\ \hline 4376.4 \end{array}$
9. (a)  $\begin{array}{r} 1.24 \\ \times 0.7 \\ \hline 0.868 \end{array}$  (b)  $\begin{array}{r} 23.9 \\ \times 0.5 \\ \hline 11.95 \end{array}$  (c)  $\begin{array}{r} 7.08 \\ \times 0.4 \\ \hline 2.832 \end{array}$  (d)  $\begin{array}{r} 4.182 \\ \times 0.3 \\ \hline 1.2546 \end{array}$  (e)  $\begin{array}{r} 5.209 \\ \times 0.6 \\ \hline 3.1254 \end{array}$
10. (a)  $\begin{array}{r} 1.92 \\ \times 0.24 \\ \hline 0.4608 \end{array}$  (b)  $\begin{array}{r} 7.05 \\ \times 0.61 \\ \hline 4.3005 \end{array}$  (c)  $\begin{array}{r} 432 \\ \times 0.73 \\ \hline 315.36 \end{array}$  (d)  $\begin{array}{r} 5.81 \\ \times 0.06 \\ \hline 0.3486 \end{array}$  (e)  $\begin{array}{r} 69.8 \\ \times 0.53 \\ \hline 36.994 \end{array}$

330 Extra practice — chapter three

## Extra Practice—Chapter Three

Write the products.

1. (a)  $8 \times 8$  64 (b)  $72 \times 10$  720 (c)  $50 \times 1000$  50 000 (d)  $83 \times 100$  8300
2. (a)  $70 \times 100$  7000 (b)  $80 \times 20$  1600 (c)  $40 \times 300$  12 000 (d)  $400 \times 200$  80 000

Multiply

3. (a)  $\begin{array}{r} 78 \\ \times 6 \\ \hline 468 \end{array}$  (b)  $\begin{array}{r} 327 \\ \times 9 \\ \hline 2943 \end{array}$  (c)  $\begin{array}{r} 6051 \\ \times 4 \\ \hline 24204 \end{array}$  (d)  $\begin{array}{r} 75007 \\ \times 8 \\ \hline 600056 \end{array}$
4. (a)  $\begin{array}{r} 68 \\ \times 51 \\ \hline 3468 \end{array}$  (b)  $\begin{array}{r} 90 \\ \times 68 \\ \hline 6120 \end{array}$  (c)  $\begin{array}{r} 543 \\ \times 49 \\ \hline 26607 \end{array}$  (d)  $\begin{array}{r} 206 \\ \times 378 \\ \hline 77868 \end{array}$
5. (a)  $\begin{array}{r} 43 \\ \times 8 \\ \hline 344 \end{array}$  (b)  $\begin{array}{r} 52.3 \\ \times 6 \\ \hline 313.8 \end{array}$  (c)  $\begin{array}{r} 406.86 \\ \times 7 \\ \hline 2848.02 \end{array}$  (d)  $\begin{array}{r} 5.147 \\ \times 8 \\ \hline 41.176 \end{array}$
6. (a)  $\begin{array}{r} 61 \\ \times 0.6 \\ \hline 36.6 \end{array}$  (b)  $\begin{array}{r} 58 \\ \times 0.9 \\ \hline 52.2 \end{array}$  (c)  $\begin{array}{r} 308 \\ \times 0.7 \\ \hline 215.6 \end{array}$  (d)  $\begin{array}{r} 5044 \\ \times 0.4 \\ \hline 2017.6 \end{array}$
7. (a)  $\begin{array}{r} 2.1 \\ \times 0.6 \\ \hline 1.26 \end{array}$  (b)  $\begin{array}{r} 17.47 \\ \times 0.5 \\ \hline 8.735 \end{array}$  (c)  $\begin{array}{r} 4709 \\ \times 0.7 \\ \hline 3296.3 \end{array}$  (d)  $\begin{array}{r} 70.8 \\ \times 0.24 \\ \hline 16.992 \end{array}$
8. There are 567 bags of rice.  
Each bag is 1.5 kg.  
How many kilograms of rice altogether? 850.5 kg
9. A merchant bought 9 leather coats.  
Each coat sold for \$176.55.  
How much did the merchant pay altogether? \$1588.95

Extra practice — chapter three 331

## Extra Practice — Chapter Four

Divide

- (a)  $4 \overline{) 68}$   $\frac{17}{}$  (b)  $7 \overline{) 98}$   $\frac{14}{}$  (c)  $3 \overline{) 75}$   $\frac{25}{}$  (d)  $6 \overline{) 84}$   $\frac{14}{}$  (e)  $5 \overline{) 85}$   $\frac{17}{}$
- (a)  $6 \overline{) 258}$   $\frac{43}{}$  (b)  $5 \overline{) 215}$   $\frac{43}{}$  (c)  $7 \overline{) 196}$   $\frac{28}{}$  (d)  $4 \overline{) 148}$   $\frac{37}{}$  (e)  $8 \overline{) 216}$   $\frac{27}{}$
- (a)  $4 \overline{) 852}$   $\frac{213}{}$  (b)  $7 \overline{) 952}$   $\frac{136}{}$  (c)  $5 \overline{) 625}$   $\frac{125}{}$  (d)  $6 \overline{) 816}$   $\frac{136}{}$  (e)  $3 \overline{) 942}$   $\frac{314}{}$
- (a)  $7 \overline{) 1064}$   $\frac{152}{}$  (b)  $5 \overline{) 1725}$   $\frac{345}{}$  (c)  $4 \overline{) 1484}$   $\frac{371}{}$  (d)  $6 \overline{) 1506}$   $\frac{251}{}$  (e)  $9 \overline{) 1287}$   $\frac{143}{}$
- (a)  $700 \div 10$   $70$  (b)  $5000 \div 100$   $50$  (c)  $100 \div 10$   $10$  (d)  $325 \div 10$   $32.5$  (e)  $4689 \div 1000$   $4.689$

Multiply

- (a)  $300 \times 0.1$   $30$  (b)  $529 \times 0.01$   $5.29$  (c)  $1000 \times 0.1$   $100$  (d)  $924 \times 0.01$   $9.24$  (e)  $6000 \times 0.1$   $600$

7. Copy and complete

- $200 \text{ cm} = \frac{2}{100} \text{ m}$
- $6 \text{ m} = \frac{60}{1000} \text{ dm}$
- $10 \text{ dm} = \frac{100}{1000} \text{ cm}$
- $2000 \text{ m} = \frac{2}{1000} \text{ km}$
- $500 \text{ mL} = \frac{0.5}{1000} \text{ L}$
- $6500 \text{ g} = \frac{6.5}{1000} \text{ kg}$
- $5 \text{ t} = \frac{5000}{1000} \text{ kg}$
- $2 \text{ d} = \frac{2880}{1440} \text{ min}$
- $\frac{365}{365} \text{ d} = 1 \text{ a}$

8. Calculate the perimeter of these shapes

- 
- 

## Extra Practice — Chapter Four

Write the quotients

- (a)  $72 \div 8$   $9$  (b)  $8000 \div 10$   $800$  (c)  $356 \div 10$   $35.6$  (d)  $18 \div 1$   $18$
- (a)  $1000 \div 10$   $100$  (b)  $64 \div 9$   $7$  (c)  $888 \div 100$   $8.88$  (d)  $306 \div 1000$   $0.306$

Divide

- (a)  $4 \overline{) 96}$   $\frac{24}{}$  (b)  $5 \overline{) 405}$   $\frac{81}{}$  (c)  $8 \overline{) 208}$   $\frac{26}{}$  (d)  $7 \overline{) 364}$   $\frac{52}{}$
- (a)  $3 \overline{) 942}$   $\frac{314}{}$  (b)  $6 \overline{) 2430}$   $\frac{405}{}$  (c)  $8 \overline{) 4096}$   $\frac{512}{}$  (d)  $7 \overline{) 5656}$   $\frac{808}{}$

5. Copy and complete

- $100 \text{ cm} = \frac{1}{100} \text{ m}$
- $1 \text{ km} = \frac{1000}{1000} \text{ m}$
- $1 \text{ cm} = \frac{10}{1000} \text{ mm}$
- $2000 \text{ mL} = \frac{2}{1000} \text{ L}$
- $5 \text{ t} = \frac{5000}{1000} \text{ kg}$
- $200 \text{ cm} = \frac{20}{1000} \text{ dm}$
- $1 \text{ leap year} = \frac{366}{366} \text{ d}$
- $2 \text{ h} = \frac{120}{60} \text{ min}$
- $5 \text{ min} = \frac{300}{60} \text{ s}$

6. Write as centimetres

- $3 \text{ m} + 3 \text{ dm} + 5 \text{ cm} + 3 \text{ mm}$   $335.3 \text{ cm}$
- $10 \text{ m} + 0 \text{ dm} + 8 \text{ cm} + 4 \text{ mm}$   $1008.4 \text{ cm}$

7. Write as metres

- $8 \text{ m} + 0 \text{ dm} + 4 \text{ cm}$   $8.04 \text{ m}$
- $3 \text{ m} + 5 \text{ dm} + 0 \text{ cm} + 9 \text{ mm}$   $3.509 \text{ m}$

8. Estimate each in the unit indicated. *Answers will vary.*

- 1 small spoon (in millilitres)
- height of the classroom ceiling (in metres)
- width of your thumbnail (in centimetres)
- distance around your schoolground (in kilometres)

9. Calculate the perimeter

- 

- 

10. Tom has 6 cans of oil.

Altogether there is 3000 mL.  
How many millilitres of oil in each can?  $500 \text{ mL}$

- Linda puts 0.5 mL of oil in each litre of gasoline for her motorbike. She has 6 L of gasoline. How much oil does she need?  $3 \text{ L}$



## Extra Practice — Chapter Five

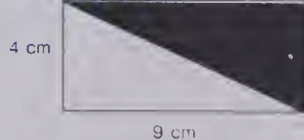
Divide

- (a)  $6 \overline{) 240}$   $\frac{40}{}$  (b)  $250 \div 5$   $\frac{50}{}$  (c)  $7 \overline{) 210}$   $\frac{30}{}$  (d)  $320 \div 8$   $\frac{40}{}$  (e)  $4 \overline{) 360}$   $\frac{90}{}$
- (a)  $23 \overline{) 161}$   $\frac{7}{}$  (b)  $31 \overline{) 248}$   $\frac{8}{}$  (c)  $29 \overline{) 203}$   $\frac{7}{}$  (d)  $41 \overline{) 246}$   $\frac{6}{}$  (e)  $37 \overline{) 296}$   $\frac{8}{}$
- (a)  $27 \overline{) 1431}$   $\frac{53}{}$  (b)  $34 \overline{) 2278}$   $\frac{67}{}$  (c)  $42 \overline{) 2394}$   $\frac{57}{}$  (d)  $51 \overline{) 2397}$   $\frac{47}{}$  (e)  $39 \overline{) 1131}$   $\frac{29}{}$
- (a)  $25 \overline{) 450}$   $\frac{18}{}$  (b)  $32 \overline{) 768}$   $\frac{24}{}$  (c)  $21 \overline{) 714}$   $\frac{34}{}$  (d)  $36 \overline{) 936}$   $\frac{26}{}$  (e)  $28 \overline{) 476}$   $\frac{17}{}$
- (a)  $34 \overline{) 4352}$   $\frac{128}{}$  (b)  $22 \overline{) 3806}$   $\frac{173}{}$  (c)  $29 \overline{) 4118}$   $\frac{142}{}$  (d)  $43 \overline{) 5375}$   $\frac{125}{}$  (e)  $54 \overline{) 7074}$   $\frac{131}{}$
- (a)  $4 \overline{) 424}$   $\frac{106}{}$  (b)  $7 \overline{) 742}$   $\frac{106}{}$  (c)  $23 \overline{) 4761}$   $\frac{207}{}$  (d)  $31 \overline{) 6355}$   $\frac{205}{}$  (e)  $26 \overline{) 7852}$   $\frac{302}{}$

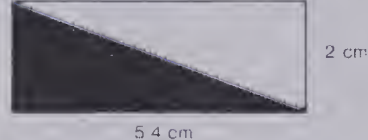
Divide. Watch for remainders

- (a)  $27 \overline{) 218}$   $\frac{8R2}{}$  (b)  $34 \overline{) 221}$   $\frac{6R17}{}$  (c)  $43 \overline{) 752}$   $\frac{17R21}{}$  (d)  $26 \overline{) 419}$   $\frac{16R3}{}$  (e)  $33 \overline{) 915}$   $\frac{27R24}{}$
- (a)  $43 \overline{) 1092}$   $\frac{25R17}{}$  (b)  $26 \overline{) 1127}$   $\frac{43R9}{}$  (c)  $33 \overline{) 5012}$   $\frac{151R29}{}$  (d)  $28 \overline{) 7321}$   $\frac{261R13}{}$  (e)  $38 \overline{) 5798}$   $\frac{152R22}{}$
- Calculate the area of each rectangle. Then find the area of the coloured triangle.

(a)  $36 \text{ cm}^2$   $\frac{18 \text{ cm}^2}{}$



(b)  $10.8 \text{ cm}^2$   $\frac{5.4 \text{ cm}^2}{}$



- Calculate the volume of a small box that is 21.5 cm wide, 28 cm long, and 6.5 cm high.  $\frac{3913 \text{ cm}^3}{160}$

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## Extra Practice — Chapter Five

Divide

- (a)  $40 \div 10$   $\frac{4}{}$  (b)  $90 \div 30$   $\frac{3}{}$  (c)  $400 \div 50$   $\frac{8}{}$  (d)  $240 \div 60$   $\frac{4}{}$   
(e)  $160 \div 40$   $\frac{4}{}$  (f)  $630 \div 70$   $\frac{9}{}$  (g)  $370 \div 50$   $\frac{7}{}$  (h)  $810 \div 90$   $\frac{9}{}$
- (a)  $22 \overline{) 66}$   $\frac{3}{}$  (b)  $31 \overline{) 186}$   $\frac{6}{}$  (c)  $43 \overline{) 301}$   $\frac{7}{}$  (d)  $52 \overline{) 468}$   $\frac{9}{}$   
(e)  $71 \overline{) 426}$   $\frac{6}{}$  (f)  $83 \overline{) 332}$   $\frac{4}{}$  (g)  $34 \overline{) 272}$   $\frac{8}{}$  (h)  $62 \overline{) 558}$   $\frac{9}{}$
- (a)  $27 \overline{) 162}$   $\frac{6}{}$  (b)  $38 \overline{) 266}$   $\frac{7}{}$  (c)  $77 \overline{) 308}$   $\frac{4}{}$  (d)  $69 \overline{) 207}$   $\frac{3}{}$   
(e)  $66 \overline{) 462}$   $\frac{7}{}$  (f)  $89 \overline{) 712}$   $\frac{8}{}$  (g)  $48 \overline{) 240}$   $\frac{5}{}$  (h)  $39 \overline{) 312}$   $\frac{8}{}$
- (a)  $23 \overline{) 144}$   $\frac{6R6}{}$  (b)  $48 \overline{) 340}$   $\frac{7R4}{}$  (c)  $78 \overline{) 500}$   $\frac{6R32}{}$  (d)  $96 \overline{) 690}$   $\frac{7R18}{}$
- (a)  $31 \overline{) 651}$   $\frac{21}{}$  (b)  $46 \overline{) 2990}$   $\frac{64}{}$  (c)  $56 \overline{) 1288}$   $\frac{23}{}$  (d)  $73 \overline{) 3285}$   $\frac{45}{}$   
(e)  $45 \overline{) 5535}$   $\frac{123}{}$  (f)  $42 \overline{) 2016}$   $\frac{48}{}$  (g)  $29 \overline{) 1334}$   $\frac{46}{}$  (h)  $46 \overline{) 6486}$   $\frac{141}{}$
- (a)  $41 \overline{) 1411}$   $\frac{101}{}$  (b)  $38 \overline{) 7638}$   $\frac{201}{}$  (c)  $52 \overline{) 5616}$   $\frac{108}{}$  (d)  $27 \overline{) 8127}$   $\frac{301}{}$   
(e)  $54 \overline{) 5995}$   $\frac{111R1}{}$  (f)  $33 \overline{) 7333}$   $\frac{222R7}{}$  (g)  $29 \overline{) 9310}$   $\frac{321R1}{}$  (h)  $19 \overline{) 1940}$   $\frac{102R2}{}$
- Divide and check each

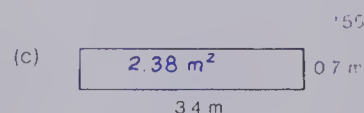
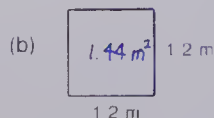
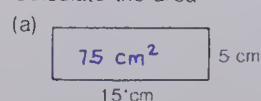
(a)  $7 \overline{) 147}$   $\frac{21}{}$

(b)  $6 \overline{) 130}$   $\frac{21R4}{}$

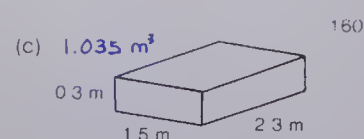
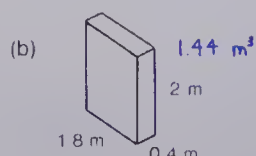
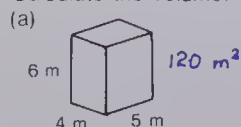
(c)  $64 \overline{) 1472}$   $\frac{23}{}$

(d)  $31 \overline{) 3164}$   $\frac{102R2}{}$

8. Calculate the area



9. Calculate the volume



Extra practice — chapter five 335

## Extra Practice — Chapter Six

1. Make the sentences true by using  $<$ ,  $>$ , or  $=$

- (a)  $8 + 7 \bullet 11 >$  (b)  $19 - 3 \bullet 16 =$  (c)  $5 \times 8 \bullet 59 <$   
 (d)  $64 \div 8 \bullet 8 =$  (e)  $23 + 9 \bullet 34 <$  (f)  $26 - 17 \bullet 19 <$

2. Solve each inequation. Then graph the solutions on a whole number line.

- (a)  $N + 7 < 10$   
 $N = 0, 1, 2$  (b)  $11 > N + 5$   
 $N = 0, 1, 2, 3, 4, 5$  (c)  $4 \times N < 19$   
 $N = 0, 1, 2, 3, 4$

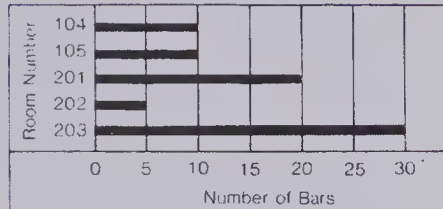
Chocolate Bar Sales  
 Maple St. School

3. (a) Which room sold the most chocolate bars? the fewest? Room 202  
 Room 203

(b) Which room sold half the number as Room 105? Room 202

(c) Which rooms sold the same number? Room 104 and Room 105

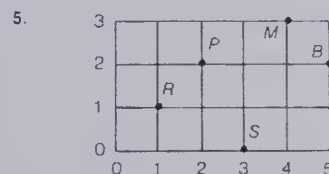
(d) The chocolate bars cost \$1.25 each.  
 How much money did each room collect?  
 How much money was collected altogether?  
 \$93.75 was collected altogether.



Room 104 collected \$12.50.  
 Room 105 collected \$12.50.  
 Room 201 collected \$25.00.  
 Room 202 collected \$6.25.  
 Room 203 collected \$37.50.

4. Copy and complete the table.  
 Rule: Multiply by 3 and add 4

Input	Output
2 10	
4 16	
5 19	
7 25	
9 31	



What letter is identified by

- (a) (2, 2)? P (b) (5, 2)? B (c) (1, 1)? R  
 (d) (4, 3)? M (e) (3, 0)? S

336 Extra practice — chapter six

## Extra Practice — Chapter Six

Solve.

1. (a)  $6 + \blacksquare = 26$  (b)  $8 \times \blacksquare = 48$  (c)  $18 + \blacksquare = 25$   
 $\blacksquare = 20$   $\blacksquare = 6$   $\blacksquare = 7$   
 (d)  $25 - \blacksquare = 5$  (e)  $28 - N = 20$  (f)  $D - 5 = 2$   
 $\blacksquare = 20$   $N = 8$   $D = 10$
2. (a)  $N < 4$  (b)  $6 > T$  (c)  $9 - 6 > N$   
 $N = 0, 1, 2, 3$   $T = 0, 1, 2, 3, 4, 5$   $N = 0, 1, 2$

3. Graph the solutions on a number line.

- (a)  $4 + N = 12$  (b)  $6 - 3 > N$  (c)  $M < 4$   
 $N = 8$   $N = 0, 1, 2$   $M = 0, 1, 2, 3$

Use the rule to complete the table.

4. Rule: Multiply by 3 and add 5.

Input	1	2	5	10
Output	8	11	20	35

5. Rule: Divide by 3 and subtract 4

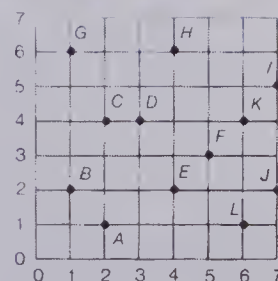
Input	30	21	15	12
Output	6	3	1	0

6. Write the ordered pair for each point

- (a) A (2, 1) (b) J (7, 2) (c) C (2, 4) (d) I (7, 5)

7. What letter is identified by

- (a) (4, 2)? E (b) (4, 6)? H  
 (c) (1, 6)? G (d) (3, 4)? D

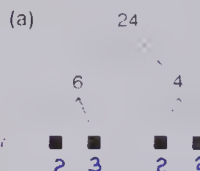
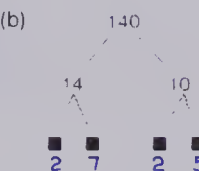
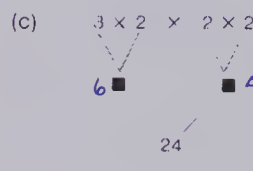


8. Draw a broken line graph to show this information.

Time of Day	08 00	10 00	12 00	14 00	16 00
Temperature	4°C	5°C	16°C	14°C	6°C

Extra practice — chapter six 337

## Extra Practice—Chapter Seven

- List each number as even or odd. 207  
 (a) 25 Odd (b) 38 Even (c) 94 Even (d) 102 Even (e) 271 Odd (f) 400 Even (g) 553 Odd
- Which of the following are divisible by 3? 209  
 (a) 235 (b) 492 (c) 552 (d) 3445 (e) 9381
- Copy and complete these factor trees. 212  
 (a)  (b)  (c) 
- (a) Use 8 squares 213  
 (b) How many rectangles can you make? 2  
 (c) Is 8 a prime or composite number? Composite number.
- (a) List the factors of 10. 1, 2, 5, 10 216  
 (b) List the factors of 30. 1, 2, 3, 5, 6, 10, 15, 30  
 (c) Draw circles around the factors common to 10 and 30
- (a) Write the first 4 multiples of 15. 15, 30, 45, 60 221  
 (b) Write the first 4 multiples of 20. 20, 40, 60, 80  
 (c) Write the least common multiple. 60
- Copy and complete. 222  
 (a)  $10^3 = 10 \times \overset{10}{\square} \times \overset{10}{\square}$  (b)  $10 \times 10 \times 10 \times 10 = 10^{\overset{4}{\square}}$   
 (c)  $10^2 = \overset{10}{\square} \times \overset{10}{\square}$  (d)  $10\,000 = 10^{\square}$

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## Extra Practice—Chapter Seven

- Which of these numbers are divisible by 3? 209  
 (a) 17 (b) 39 (c) 69 (d) 114 (e) 555
- Which of these numbers are divisible by 5? 208  
 (a) 67 (b) 1560 (c) 3555 (d) 7009 (e) 8005
- Which of these numbers are divisible by 9? 209  
 (a) 111 (b) 229 (c) 162 (d) 1098 (e) 70 002
- Which of these numbers are divisible by 4? 207  
 (a) 44 (b) 561 (c) 1704 (d) 58 724 (e) 64 312
- Express the following as the product of prime factors. 214  
 (a)  $\overset{56}{2 \times 2 \times 2 \times 7}$  (b)  $\overset{84}{2 \times 2 \times 3 \times 7}$  (c)  $\overset{64}{2 \times 2 \times 2 \times 2 \times 2 \times 2}$  (d)  $\overset{76}{2 \times 2 \times 19}$  (e)  $\overset{124}{2 \times 2 \times 31}$
- Which are prime? composite? 213  
 (a) 11 Prime (b) 57 Composite (c) 66 Composite (d) 98 Composite (e) 71 Prime
- Write the first 4 multiples of each. 219  
 (a) 3 3, 6, 9, 12 (b) 9 9, 18, 27, 36 (c) 15 15, 30, 45, 60 (d) 25 25, 50, 75, 100 (e) 50 50, 100, 150, 200
- Write the least common multiple of each pair. 221  
 (a) 3, 4 12 (b) 6, 8 24 (c) 5, 10 10 (d) 5, 7 35 (e) 4, 12 12
- Write the greatest common factor of each pair. 217  
 (a) 6, 8 2 (b) 10, 20 10 (c) 12, 20 4 (d) 10, 15 5 (e) 8, 12 4
- Which of the following are true? 198-202  
 (a)  $512 \times 1 = 512$  (b)  $6 \times 0 = 6$  (c)  $27 \times 43 = 43 \times 27$   
 (d)  $7 \div 0 = 7$  (e)  $0 - 7 = 0$  (f)  $9 + 5 = 5 + 9$   
 (g)  $52 \div 3 = 3 \div 52$  (h)  $9 \div 0 = 0$  (i)  $16 - 4 = 4 - 16$



## Extra Practice—Chapter Eight

1. Are these fractions equivalent? (Use cross products to check.)

(a)  $\frac{3}{5}, \frac{9}{15}$  **Yes**  
 $45 = 45$

(b)  $\frac{1}{2}, \frac{5}{11}$  **No**  
 $11 \neq 10$

(c)  $\frac{3}{4}, \frac{6}{10}$  **No**  
 $30 \neq 24$

(d)  $\frac{2}{3}, \frac{6}{9}$  **Yes**  
 $18 = 18$

Perform the indicated operations

2. (a)  $\frac{1}{2}$  of 12 **6**

(b)  $\frac{4}{5}$  of 30 **24**

(c)  $\frac{3}{10} + \frac{7}{10}$   **$\frac{10}{10}$  or 1**

(d)  $\frac{3}{4} + \frac{1}{8}$   **$\frac{7}{8}$**

3. (a)  $\frac{1}{5} + \frac{2}{3}$   **$\frac{13}{15}$**

(b)  $\frac{9}{10} - \frac{3}{10}$   **$\frac{6}{10}$  or  $\frac{3}{5}$**

(c)  $\frac{5}{6} - \frac{1}{2}$   **$\frac{2}{6}$  or  $\frac{1}{3}$**

(d)  $\frac{7}{8} - \frac{2}{5}$   **$\frac{19}{40}$**

4. (a)  $5\frac{1}{6} + 3\frac{5}{6}$   
 **$8\frac{6}{6}$  or 9**

(b)  $3\frac{1}{2} + 1\frac{3}{8}$   
 **$4\frac{7}{8}$**

(c)  $9\frac{1}{5} - 2\frac{1}{2}$   
 **$7\frac{3}{10}$**

(d)  $20.73 - 8.49$   
**12.24**

5. Express each fraction as a percent

(a)  $\frac{53}{100}$  **53%**

(b)  $\frac{3}{10}$  **30%**

(c)  $\frac{9}{25}$  **36%**

(d)  $\frac{13}{50}$  **26%**

6. Write as a decimal

(a)  $\frac{93}{100}$  **0.93**

(b)  $\frac{6}{25}$  **0.24**

(c) 72% **0.72**

(d) 20% **0.2**

7. Write as a fraction.

(a) 0.5  **$\frac{5}{10}$  or  $\frac{1}{2}$**

(b) 0.48  **$\frac{48}{100}$  or  $\frac{12}{25}$**

(c) 3.2  **$3\frac{2}{10}$  or  $3\frac{1}{5}$**

(d) 0.72  **$\frac{72}{100}$  or  $\frac{18}{25}$**

Solve.

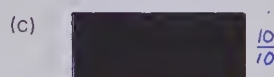
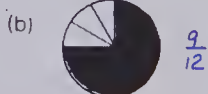
8. (a) 50% of 20 **10** (b) 40% of \$60 **\$24** (c) 10% of \$350 **\$35** (d) 90% of \$50 **\$45**

9. Sari scored 12 bull's-eyes in darts out of 50 darts thrown.  
What percent of her darts hit the bull's-eye? **24%**

10. Maki saved 30% of his paper route earnings.  
Last year he had made \$600 selling papers.  
How much did he save last year? **\$180**

## Extra Practice—Chapter Eight

1. What fraction is coloured?



2. Write equivalent fractions.

(a)  $\frac{1}{4} = \frac{3}{12}$

(b)  $\frac{3}{5} = \frac{6}{10}$

(c)  $\frac{7}{8} = \frac{21}{24}$

(d)  $\frac{8}{10} = \frac{60}{100}$

3. Add or subtract.

(a)  $\frac{1}{2} + \frac{1}{4}$   **$\frac{3}{4}$**

(b)  $\frac{1}{4} + \frac{2}{5}$   **$\frac{13}{20}$**

(c)  $\frac{3}{6} + \frac{1}{2}$   **$\frac{7}{6}$**

(d)  $\frac{5}{8} - \frac{1}{2}$   **$\frac{1}{8}$**

(e)  $\frac{7}{10} - \frac{1}{2}$   **$\frac{2}{10}$  or  $\frac{1}{5}$**

(f)  $\frac{7}{8} - \frac{3}{5}$   **$\frac{11}{40}$**

(g)  $\frac{7}{8} - \frac{1}{4}$   **$\frac{5}{8}$**

(h)  $\frac{1}{3} + \frac{1}{9}$   **$\frac{4}{9}$**

(i)  $3\frac{1}{4} + 2\frac{1}{2}$   
 **$5\frac{7}{4}$**

(j)  $5\frac{7}{8} - 2\frac{1}{2}$   
 **$3\frac{3}{8}$**

(k)  $6\frac{4}{5} - 1\frac{3}{10}$   
 **$5\frac{5}{10}$  or  $5\frac{1}{2}$**

(l)  $7\frac{3}{5} + 4\frac{1}{6}$   
 **$11\frac{23}{30}$**

4. Write each as a percent.

(a)  $\frac{27}{100}$  **27%**

(b)  $\frac{5}{10}$  **50%**

(c)  $\frac{19}{25}$  **76%**

(d)  $\frac{41}{50}$  **82%**

(e)  $\frac{3}{5}$  **60%**

5. Write each as a decimal.

(a)  $\frac{87}{100}$  **0.87**

(b)  $\frac{50}{75}$  **0.2**

(c) 45% **0.45**

(d) 90% **0.9**

(e)  $\frac{15}{25}$  **0.6**

6. Find.

(a) 30% of 80 **24**

(b) 60% of 120 **72**

(c) 80% of \$50 **\$40**

7. Jill got 18 out of 20 marks on a test.  
What percent did she get correct? **90%**

8. The regular price for a pair of hockey skates is \$34.  
They are on sale at 80% of the regular price.  
What is the sale price? **\$27.20**

9. Use cross products. Copy and replace each  $\bullet$  with  $<$ ,  $>$ , or  $=$

(a)  $\frac{4}{5} \bullet \frac{5}{8}$   **$>$**

(b)  $\frac{5}{7} \bullet \frac{6}{8}$   **$<$**

(c)  $\frac{8}{12} \bullet \frac{10}{16}$   **$>$**

(d)  $\frac{7}{15} \bullet \frac{22}{45}$   **$<$**

## Extra Practice—Chapter Nine

Show your estimates for each, then calculate.

- (a)  $\begin{array}{r} 465 \\ + 219 \\ \hline 684 \end{array}$  <sup>500</sup> <sup>+200</sup> <sup>700</sup>

(b)  $\begin{array}{r} 690 \\ + 187 \\ \hline 877 \end{array}$  <sup>700</sup> <sup>+200</sup> <sup>900</sup>

(c)  $\begin{array}{r} 523 \\ - 176 \\ \hline 347 \end{array}$  <sup>500</sup> <sup>-200</sup> <sup>300</sup>

(d)  $\begin{array}{r} 403 \\ - 265 \\ \hline 138 \end{array}$  <sup>400</sup> <sup>-300</sup> <sup>100</sup>

(e)  $\begin{array}{r} 750 \\ - 463 \\ \hline 287 \end{array}$  <sup>800</sup> <sup>-500</sup> <sup>300</sup>
- (a)  $\begin{array}{r} 2468 \\ + 1973 \\ \hline 4441 \end{array}$

(b)  $\begin{array}{r} 5079 \\ + 3185 \\ \hline 8264 \end{array}$

(c)  $\begin{array}{r} 3412 \\ - 1875 \\ \hline 1537 \end{array}$

(d)  $\begin{array}{r} 9103 \\ - 4719 \\ \hline 4384 \end{array}$

(e)  $\begin{array}{r} 7033 \\ - 4816 \\ \hline 2217 \end{array}$
- (a)  $\begin{array}{r} 37 \\ \times 6 \\ \hline 222 \end{array}$

(b)  $\begin{array}{r} 296 \\ \times 5 \\ \hline 1480 \end{array}$

(c)  $\begin{array}{r} 84 \\ \times 27 \\ \hline 2268 \end{array}$

(d)  $\begin{array}{r} 63 \\ \times 45 \\ \hline 2835 \end{array}$

(e)  $\begin{array}{r} 78 \\ \times 34 \\ \hline 2652 \end{array}$
- Use short division to find the quotients.
 

(a)  $6 \overline{) 78}$  (b)  $3 \overline{) 87}$  (c)  $4 \overline{) 228}$  (d)  $7 \overline{) 441}$  (e)  $5 \overline{) 245}$
- Divide. Express the remainder as a fraction.
 

(a)  $7 \overline{) 955} \frac{3}{7}$  (b)  $8 \overline{) 973} \frac{5}{8}$  (c)  $3 \overline{) 1024} \frac{1}{3}$  (d)  $8 \overline{) 1211} \frac{3}{8}$  (e)  $6 \overline{) 2231} \frac{5}{6}$

Divide.

- (a)  $5 \overline{) 4.5}$  (b)  $7 \overline{) 4.9}$  (c)  $4 \overline{) 28.52}$  (d)  $8 \overline{) 29.12}$  (e)  $7 \overline{) 15.75}$
- (a)  $41 \overline{) 24.6}$  (b)  $29 \overline{) 14.5}$  (c)  $37 \overline{) 96.2}$  (d)  $22 \overline{) 81.4}$  (e)  $27 \overline{) 91.8}$
- (a)  $32 \overline{) 78.72}$  (b)  $24 \overline{) 93.84}$  (c)  $35 \overline{) 78.75}$  (d)  $21 \overline{) 70.98}$  (e)  $43 \overline{) 99.33}$

Perform the operations.

- (a)  $5 + 7 \times 3 = 26$  (b)  $12 + 8 - 4 = 16$  (c)  $14 + 10 - 2 = 22$
- (a)  $20 - 4 - 3 = 13$  (b)  $(16 - 5) \times 3 = 33$  (c)  $30 - (2 \times 5) = 26$
- (a)  $6 \times 7 + 3 \times 8 = 66$  (b)  $(21 - 9) \times (12 - 3) = 48$  (c)  $18 - 2 \times 7 - 1 = 9$

- (a)  $\begin{array}{r} 2000 \\ + 2000 \\ \hline 4000 \end{array}$  (b)  $\begin{array}{r} 5000 \\ + 3000 \\ \hline 8000 \end{array}$

(c)  $\begin{array}{r} 3000 \\ - 2000 \\ \hline 1000 \end{array}$  (d)  $\begin{array}{r} 9000 \\ - 5000 \\ \hline 4000 \end{array}$

(e)  $\begin{array}{r} 7000 \\ - 5000 \\ \hline 2000 \end{array}$

- (a)  $\begin{array}{r} 30 \\ \times 6 \\ \hline 180 \end{array}$   $\begin{array}{r} 40 \\ \times 7 \\ \hline 280 \end{array}$

Between 180 and 280.

- (b)  $\begin{array}{r} 200 \\ \times 5 \\ \hline 1000 \end{array}$   $\begin{array}{r} 300 \\ \times 5 \\ \hline 1500 \end{array}$

Between 1000 and 1500.

- (c)  $\begin{array}{r} 80 \\ \times 20 \\ \hline 1600 \end{array}$   $\begin{array}{r} 90 \\ \times 30 \\ \hline 2700 \end{array}$

Between 1600 and 2700.

- (d)  $\begin{array}{r} 60 \\ \times 40 \\ \hline 2400 \end{array}$   $\begin{array}{r} 70 \\ \times 50 \\ \hline 3500 \end{array}$

Between 2400 and 3500.

- (e)  $\begin{array}{r} 70 \\ \times 30 \\ \hline 2100 \end{array}$   $\begin{array}{r} 80 \\ \times 40 \\ \hline 3200 \end{array}$

Between 2100 and 3200.

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## Extra Practice—Chapter Nine

1. Show your estimates for each, then calculate.

- (a)  $\begin{array}{r} 290 \\ + 415 \\ \hline 705 \end{array}$  <sup>300</sup> <sup>+400</sup> <sup>700</sup>

(b)  $\begin{array}{r} 988 \\ - 782 \\ \hline 206 \end{array}$  <sup>268</sup> <sup>-800</sup> <sup>200</sup>

(c)  $\begin{array}{r} 62 \\ \times 59 \\ \hline 3658 \end{array}$  <sup>60</sup> <sup>3000</sup> <sup>70</sup> <sup>4200</sup>

(d)  $\begin{array}{r} 3538 \\ - 58 \\ \hline 3480 \end{array}$  <sup>17690</sup> <sup>3000</sup> <sup>4000</sup> <sup>5</sup> <sup>20000</sup>

2. Use short division to find the quotients.

- (a)  $7 \overline{) 147}$  (b)  $5 \overline{) 165}$  (c)  $8 \overline{) 424}$  (d)  $6 \overline{) 1830}$

(e)  $9 \overline{) 207}$  (f)  $4 \overline{) 224}$  (g)  $7 \overline{) 16.1}$  (h)  $8 \overline{) 81.6}$

3. Divide. Express the remainder as a fraction.

- (a)  $7 \overline{) 258} \frac{6}{7}$  (b)  $8 \overline{) 811} \frac{3}{8}$  (c)  $12 \overline{) 329} \frac{5}{12}$  (d)  $36 \overline{) 1987} \frac{7}{36}$

4. Divide

- (a)  $22 \overline{) 26.4}$  (b)  $36 \overline{) 151.2}$  (c)  $41 \overline{) 147.6}$  (d)  $57 \overline{) 18.24}$

(e)  $20 \overline{) 6.6}$  (f)  $28 \overline{) 7.28}$  (g)  $19 \overline{) 3.61}$  (h)  $16 \overline{) 11.36}$

5. Perform the operations.

- (a)  $(17 - 9) \times 3 = 24$  (b)  $18 - 2 \times 5 = 8$  (c)  $64 + 12 - 3 = 73$

(d)  $4 \times (6 + 1) - 2 = 26$  (e)  $6 \times 5 + 5 - 5 = 31$  (f)  $3 - 3 + 9 - 9 = 0$

6. Calculate the average of each set of numbers

- (a) 31, 62, 59, 64 <sup>54</sup> (b) 123, 415, 215, 175, 222 <sup>230</sup>

7. Copy and insert brackets to make each number sentence true.

- (a)  $3 + 9 \times 3 + 8 = 1$  (b)  $56 - 9 - 4 + 2 = 45$  <sup>No brackets needed.</sup>

(c)  $60 - 10 + 5 + 5 = 16$  <sup>No brackets needed.</sup> (d)  $72 - 9 + 3 - 3 = 8$  <sup>No brackets needed.</sup>

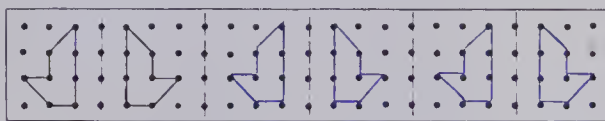
- 187.2 cm of wire is cut into 8 equal pieces. How long is each piece? <sup>23.4 cm</sup>

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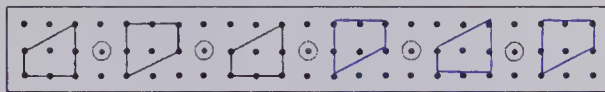
## Extra Practice — Chapter Ten

Copy and complete these patterns.

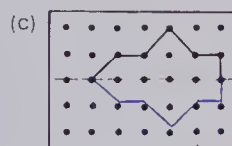
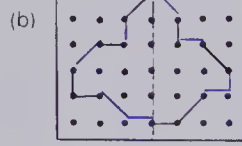
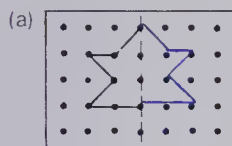
1. Flip images



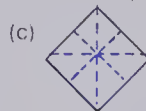
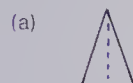
2. Turn images



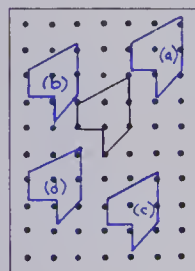
3. Copy and complete these flip images.



4. Copy and draw in all lines of symmetry (Use a dotted line)



5. Copy this figure and draw the slide images of this figure



(a) Right 2, up 2.

(b) Left 2, up 1.

(c) Right 1, down 4

(d) Left 2, down 3

Label the new images (a), (b), (c), and (d).

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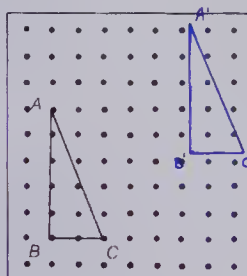
## Extra Practice — Chapter Ten

1. Trace each. Complete the mirror pattern

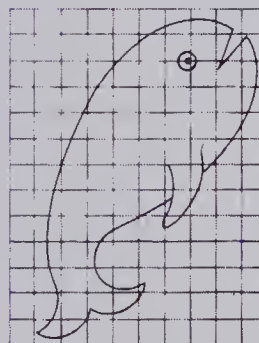


2. Trace  $\triangle ABC$ .

Then make a pattern to show a slide right 5, up 3

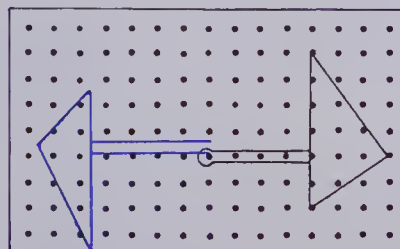


3. Copy this whale on larger grid paper



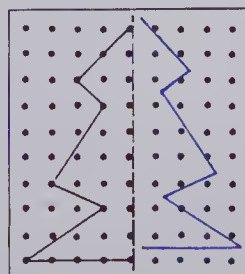
4. Copy and draw a  $\frac{1}{2}$  turn.

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5. Copy and make a flip pattern.

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6. Draw a pattern to make a wallpaper design using slides, turns, and or flips

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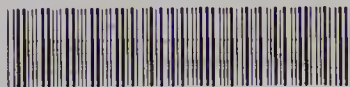
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